



*National Rivers Authority
Anglian Region*

PILOT
ENVIRONMENTAL AUDIT

NRA
LEIGH, TONBRIDGE,
DISTRICT OFFICE

SOUTHERN REGION

ENVIRONMENT AGENCY



099614

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National Rivers Authority Information Centre Head Office
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CLIENT Kevin Whiteman, RGM Southern Region.

AUDITEE Leigh District Office,
Tonbridge,
and associated off-site activities.

AUDITORS Environmental Policy Unit

Lead Auditor Dave Stanley (EPU)
Audit co-ordinator Martin Diaper (EPU)
Auditors Marion Adkins (Internal Audit)
Nigel Marshall (Thames)

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EXECUTIVE SUMMARY

Audit

The NRA is progressively extending and improving its own internal environmental management as required by its Environmental Policy. As essential and integral part of environmental management is environmental auditing.

A target for the EPU for 94/95 was to develop appropriate environmental auditing procedures for the NRA. Three pilot audits are being carried out to test and refine the procedures.

Environmental auditing identifies the strengths and weaknesses of a location or function. It facilitates the transfer of best practice in waste minimisation and environmental protection, and enables corrective action to be taken where required. Environmental Auditing therefore both enhances and protects the credibility of the NRA, thereby giving confidence to both Board and management. It also enables us to demonstrate that we practice that which we preach.

We have adopted a three tier approach to environmental auditing.

- **Management:** the degree of understanding and commitment to environmental management by staff at all levels. Knowledge of NRA Environmental Policy and implementation. The production and promulgation of management procedures. The existence of a system for measuring, monitoring and reporting;
- **Operations:** environmental performance and efficiency gains through effective resource management and waste minimisation measures. Efficacy of procedures to measure and monitor management processes/activities. The inclusion in contracts of measures to ensure appropriate environmental standards; and
- **Environmental Impacts:** identification of emissions and waste streams. Existence of permits and consents for discharges. Compliance with statutory controls on emissions. Compliance with best practice.

These are the three primary "control" areas for effective environmental management. The procedures and report reflect this approach and will enable an audit to focus according to the nature of the location.

Pilot

The second pilot environmental audit was carried out at a depot at Leigh in Southern region. Only the depot and related off-site activities were audited. At Leigh the emphasis was on Operations and Environment. Nevertheless, some key issues were identified under management.

The team carried out the audit over two days. The openness and co-operation of the staff, along with their willingness to consider further environmental measures was most encouraging. Management at the site were verbally debriefed on our departure.

Recommendations

The table below lists 31 key recommendations. Full recommendations are contained in the appropriate sections of the report.

In addition to management taking specific action to implement the Environmental Policy's objectives and targets, and integrate environmental management into the site's functions, the report recommends that a single manager at the site be made responsible for co-ordinating the environmental performance and management measures at the site.

The audit team was concerned at the apparent absence of procedures, particularly in respect of pollution incidents and waste disposal.

As with the first pilot audit at Brampton, it is anticipated that this report will be widely circulated to other regions to enable the maximum benefit to be derived. A number of environmental issues have been "flagged up" but, owing to resource limitations, not necessarily audited through. The purpose is to raise awareness amongst all readers of possible concerns in respect of our operations.

A number of the recommendations are not "site specific" and would benefit from being considered at policy level.

There are a number of recommendations that need urgent attention (compliance) and others which, in our view, represent a risk to our credibility if the "possible" were to happen and should be tackled likewise. These have been asterisked below.

The EPU has recently produced a Pollution Prevention Checklist (PPC) which summarises previous advice and guidance on best practice and identifies key areas for environmental legal compliance. All sites have been

instructed to comply with the PPC. Any site so doing should be legally complaint and should expect a good environmental report in the event of an audit.

Feedback

Following the first audit, the audit protocols were revised and improved. On this audit, the team have concentrated on developing and improving the style and format of the report. I would welcome any comments on the report, or indeed any aspect of the audit.

A third pilot audit is being arranged for another depot, following which a full report on "Implementing Environmental Auditing in the NRA" will be produced.

D R Stanley
Head, Environmental Policy Unit.

SUMMARY OF KEY RECOMMENDATIONS PILOT ENVIRONMENTAL AUDIT; LEIGH, SOUTHERN REGION

Audit Report No: NE2/4/2/5 Leigh, Tonbridge, Southern Region		Page 1				
Rec No	Report Para No	Recommendations	Est Cost Implementation	Management Comments and Action	Officer Responsible	Implementation of Target Date
	3.3	<p>MANAGEMENT</p> <p>Environmental Management System</p> <ul style="list-style-type: none"> • A manager at Leigh should be responsible for co-ordinating site environmental performance and management measures. • Translate the Environmental Policy objectives and targets to reflect Area environmental priorities and disseminate to all functions. 				
	3.4	<p>Environmental Management - Objectives and Targets</p> <ul style="list-style-type: none"> • Develop and implement site specific environmental objectives and targets. • Allocate waste minimisation targets to all managers and incorporate into PRP. 				

These recommendations are summaries only, for full recommendations see report.

Rec No	Report Para No	Recommendations	Est Cost Implementation	Management Comments and Action	Officer Responsible	Implementation of Target Date
		<p>OPERATIONS</p> <p>4.2 Energy Management</p> <ul style="list-style-type: none"> ● Implement the NIFES energy report recommendations. ● Identify the cause of excessive electricity consumption. <p>4.4 Transportation</p> <ul style="list-style-type: none"> ● Actively manage data from the new transport management system and ensure all drivers know their performance. ● Fully brief all staff on the objectives and benefits of the efficient driving project. <p>4.6 Emergency Procedures</p> <ul style="list-style-type: none"> ● Provide emergency (spill, fire) procedures for the site. * 				

These recommendations are summaries only, for full recommendations see report.

Rec No	Report Para No	Recommendations	Est Cost Implementation	Management Comments and Action	Officer Responsible	Implementation of Target Date
	4.8	<p>Off-Site Activities - Operational Aspects</p> <ul style="list-style-type: none"> • Incorporate best environmental standards into contract documents and ensure compliance. 				

These recommendations are summaries only, for full recommendations see report.

Rec No	Report Para No	Recommendations	Est Cost Implementation	Management Comments and Action	Officer Responsible	Implementation of Target Date
		<p>ENVIRONMENTAL IMPACTS</p> <p>5.2 Land Use and Maintenance</p> <ul style="list-style-type: none"> • Develop landscape management scheme for office and barrier. <p>5.4 Water and Wastewater</p> <ul style="list-style-type: none"> • Produce accurate site drainage plan and complete colour coding of inspection chamber covers. • Clarify surface water drainage with respect to final discharge • Implement sampling programme for sewage discharge and implement service schedule for sewage treatment plant. * • Install oil separator to surface water drainage system. 				

These recommendations are summaries only, for full recommendations see report.

Rec No	Report Para No	Recommendations	Est Cost Implementation	Management Comments and Action	Officer Responsible	Implementation of Target Date
	5.5	<p>Environmentally Hazardous Substances</p> <ul style="list-style-type: none"> ● Produce and promulgate spillage procedures for site. * ● Ensure all storage areas comply with our pollution prevention guidelines, especially drum storage areas. * ● Seal bulk oil tank bund drain outlet. ● Adjust bulk oil vent pipe to prevent escape from surcharging during fills. ● Bring oil tank within generator house up to PPG 2 standard. ● Bund oil drums within generator house. ● Secure generator house against spillages. ● Bring outside drum storage areas up to PPG 11. 				

These recommendations are summaries only, for full recommendations see report.

Rec No	Report Para No	Recommendations	Est Cost Implementation	Management Comments and Action	Officer Responsible	Implementation of Target Date
	5.6	<p>Waste Management</p> <ul style="list-style-type: none"> ● Ensure compliance with waste disposal Duty of Care for all site waste. * ● Use NRA standard conditions of contract for site waste disposal. ● Issue procedures for best environmental practice at pollution incidents. * 				
	5.7	<p>Off-Site Activities - Environmental Impacts</p> <ul style="list-style-type: none"> ● Ensure waste and spoil is handled in compliance with the Waste Disposal Duty of Care. * ● Transport fuel in banded pallets or bowzers. ● Fuel drums on the dredger are secured and banded and absorbents are carried. * 				

These recommendations are summaries only, for full recommendations see report.

Rec No	Report Para No	Recommendations	Est Cost Implementation	Management Comments and Action	Officer Responsible	Implementation of Target Date
	5.7	<p>Off-Site Activities - Environmental Impacts</p> <ul style="list-style-type: none"> ● Refuel plant away from the water course, with spill absorbents available. ● Produce, brief and display spill procedures. 				

These recommendations are summaries only, for full recommendations see report.

Audit Report No:							
Rec No	Report Para No	Recommendations	Est Cost Implementation	Management Comments and Action	Officer Responsible	Implementation of Target Date	
		BLANK FORM FOR USE BY REGION/AREA STAFF TO ACTION PLAN REMAINING RECOMMENDATIONS					

These recommendations are summaries only, for full recommendations see report.

1.0 AIMS AND OBJECTIVES OF THE PILOT AUDIT

1.1 Background

1.1.1 Environmental Policy

In 1992 the NRA Board acknowledged the importance of environmental management by adopting the NRA Internal Environmental Policy statement and objectives. The statement includes:

"In addition to vigorously pursuing its statutory responsibilities as Guardians of the Water Environment, the Authority will aim to establish and demonstrate wise environmental practice throughout all its functions."

The NRA has established a corporate environmental management organisation, which at the centre includes the Environmental Policy Unit (EPU), with 2.5 staff, and an Environmental Steering Group (ESG). Together, the EPU and ESG have responsibility for advising on policy development, procedures, instruction, practices and proposing targets.

Regions nominate a Regional Co-ordinator to the ESG who should also be responsible for advising the Regional General Manager on the implementation of the NRA Environmental Policy and best environmental management practice. Line management is responsible for implementing best practice, for pursuing the objectives and achieving the targets. Regional Business Services Managers have recently been made responsible for producing quarterly environmental performance data. Many regions have also established environmental teams or circles to support the policy and gain the interest and enthusiasm of all staff.

1.1.2 Environmental Auditing

Generally, companies and organisations are becoming increasingly aware of the need to achieve an improved level of environmental performance. They have been motivated for a number of reasons including their potential liabilities resulting from environmental legislation; the potential for cutting costs; emerging fiscal measures; and a desire to improve their public relations image as, increasingly, public concern about the environment grows.

As a result many organisations have undertaken environmental audits in order to identify and clarify potential liabilities, compliance status and to identify how their environmental performance can be improved.

To be effective these audits must be undertaken within the framework of a structured environmental management organisation.

Formal environmental management systems, such as the British Standard on Environmental Management Systems (BS 7750: 1994) and the European Union Eco-Management and Audit Scheme (EMAS) Regulation (EU 1863/93), include environmental audits as an essential and integral part. They provide organisations with the necessary assurance that their activities comply with the appropriate legislative, regulatory and company policy requirements.

1.2 Introduction to the Audit

The aim of the pilot audit was to independently assess the environmental status and performance of the site and its related off-site operations, by examining in detail the activities of operational facilities (offices and storage areas) and a sample of its remote activities. The audit focused on the operational and environmental aspects of these activities, i.e. waste minimisation, buildings and their environs, transport, elimination of toxic substances, emissions and energy efficiency.

Four overall objectives were identified that applied to the pilot audit;

- to evaluate the effectiveness of the draft auditing procedures,
- to develop NRA staff expertise in environmental auditing,
- to receive feed-back from auditees on the audit and draft procedures, and
- to produce an environmental audit report for the benefit of the auditees, that may serve as a guide to all other NRA locations, prior to the establishment of a full auditing programme.

1.3 Objectives of the Leigh Audit

In addition to the objectives above, three site specific objectives of the audit at Leigh were:

- Risks to the credibility of the NRA, specifically;
 - legal compliance,
 - concerns expressed by external organisations,
 - risks to the environment, especially water,
 - implementation of the NRA's own guidelines to external bodies. (Pollution Prevention Pays video, Pollution Prevention Guidance notes, etc.), and
 - visual appearance.

- The integration of environmental management into existing management systems;
 - waste minimisation/environmental performance against targets and procedures, etc, especially water and energy, and
 - environmental standards for internal operations and the use of contractors.
- The identification of strengths and best practice to highlight to other areas and regions.

1.4 Process

Before visiting the site regulatory information was assessed (from water companies, local authorities, etc) and the environmental setting and past land-use of the site and surrounding area examined. On-site work was by auditors drawn from the Environmental Policy Unit, Internal Audit and Pollution Prevention. The team audited with respect to management systems, operational systems and environmental impacts. The methods used included physical examination of the sites, discussions with staff and examination of documentary evidence.

In pursuing the objectives, the audit investigated the location at three levels:

- **Management:** the degree of understanding, and commitment to environmental management by staff at all levels. Knowledge of NRA Environmental Policy and the approach to implementation, and its objectives and targets. The resources allocated to environmental management. The managerial and administrative systems used to ensure implementation of best environmental practice. The production and promulgation of management procedures. The existence of a system for measuring, monitoring and reporting;
- **Operations:** environmental performance and efficiency gains through effective resource management and waste minimisation measures. Efficacy of procedures to measure and monitor management processes/activities. The inclusion in contracts (internal and external) of measures to ensure appropriate environmental standards; and
- **Environmental Impacts:** identification of emissions and waste streams. Existence of permits and consents for discharges. Effectiveness of measuring and monitoring of discharges whether controlled by statute or not. Compliance with statutory controls on emissions. Compliance with NRA best practice as given to outside bodies. Implementation of best practice above that required by national procedures.

1.5 Audit Criteria

The site was audited against best practice as described in;

- NRA Internal Environmental Policy, and its targets,
- legislative requirements, e.g. waste duty of care,
- NRA guidance to external bodies,
- industrial best practice, and
- environmental management systems standards, e.g. BS7750 and EMAS.

1.6 Audit Boundaries

The audit was limited, on a managerial hierarchy basis, to activities on site at the Leigh District Office and those controlled from Leigh. It did not consider functions directly affecting Leigh but performed by the Area Office.

Geographically, the Leigh Office and its associated NRA activities were examined together with four remote working sites chosen during the Audit. Adjacent, non-NRA activities were not included.

1.7 Audit Approach

A phased approach to the audit was adopted and included;

- assessment of background information from regulatory authorities, etc,
- issue of a pre-audit briefing to site staff including a request for information questionnaire,
- the pilot audit,
- audit de-brief with site management, and
- the preparation of the audit report.

1.8 Administration

The NRA Environmental Audit Guidelines are being developed to support best environmental management practice whilst minimising cost and any disruption to the operational work of the audited sites.

Sites are requested to have ready essential documentation at the commencement of on the on-site work. (Discharge consents, licences, site plans, etc - see Annex 1). The site's environmental audit co-

ordinator was absent on compassionate leave just prior to the audit and no documentation was available on arrival at Leigh, which inevitably limited the quality of the audit.

1.9 Feedback

Comments from auditees on how to further improve the report and any aspect of the audit are welcomed.

2.0 SITE DESCRIPTION

2.1 Site setting

2.1.1 Leigh Office and Barrier.

The site is located approximately 3km west south west of Tonbridge at National Grid Reference TQ 562 463 (see Figure 1) and comprises two buildings, of predominately office accommodation, with a flood defence barrier starting about 100m to the south. The main barrier consists of a large earth work, about 1.5km long, across the valley of the River Medway with an electrically powered hydraulic sluice gate in the river. About 1.5km west of the barrier is an associated electrically powered pumping station of the archimedes screw type.

The site is in a rural location accessed from the B2027 by Powder Mills Lane. Immediately to the north is a farm complex now used as a depot for the storage of up to 60 tonnes of liquid petroleum gas for cylinder distribution. To the north west of the office is a private dwelling with its garden forming the western boundary of the site. South of the barrier is the Hayesden Country Park, a local authority owned recreation area. A public footpath runs along the northern bank of the Medway and crosses the barrier.

The Powder Mill Stream, a tributary of the River Medway is the nearest surface water feature, flowing west to east in the valley immediately downhill from the office. This stream comes off the main River Medway channel some 100 meters upstream of the embankment and sluice structure. (See Picture 2, Section 5.2).

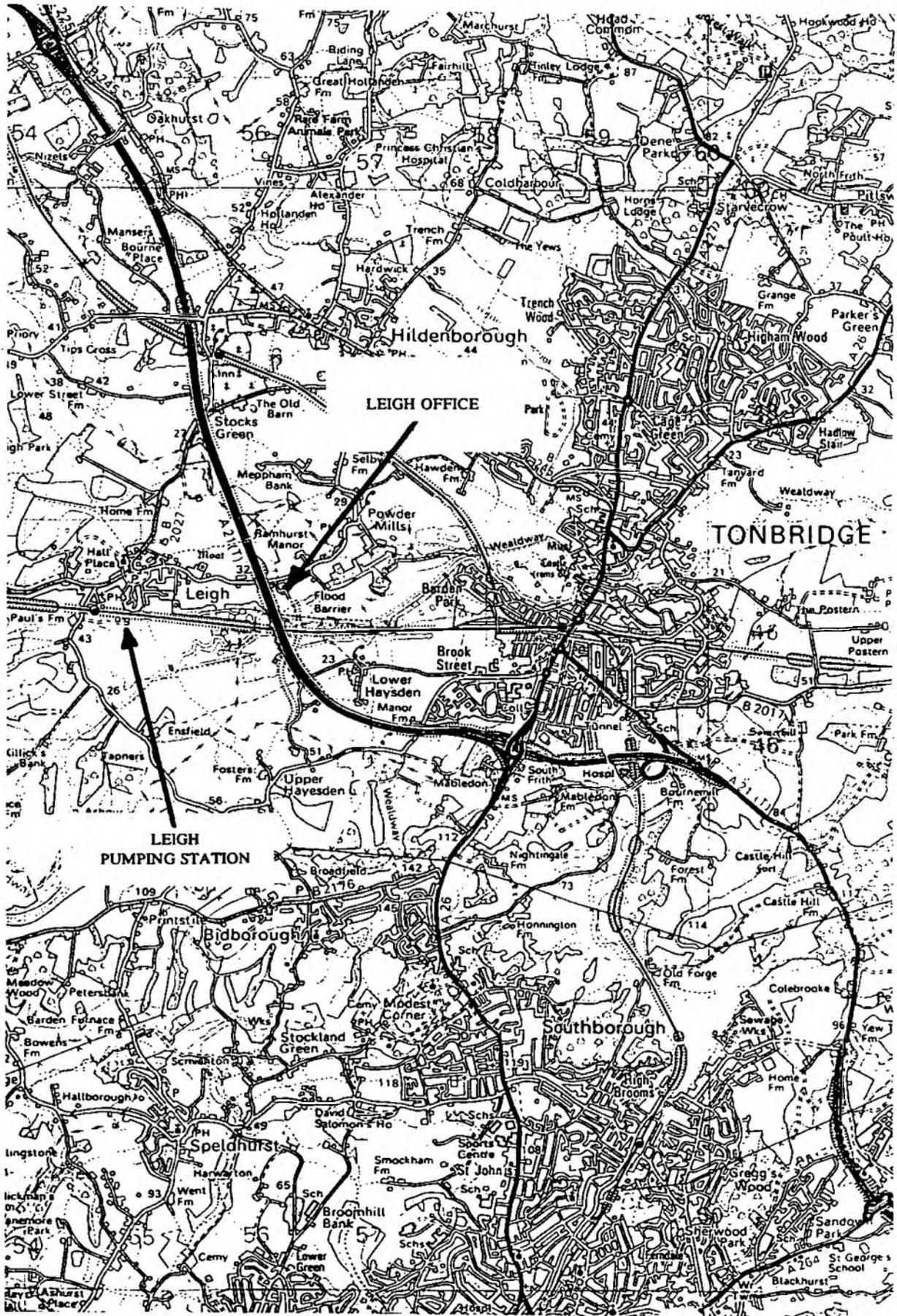
2.1.2 Remote Locations

Four remote sites were inspected during the audit. On the Isle of Grain two locations were examined, stone pitching repairs to the sea wall of the Medway Estuary to the South of Kingsnorth power station, and river dredging from the bank of the Yantlet Creek, a minor stream flowing to the Thames estuary. (National Grid References TQ 804 717, TQ 848 769 respectively). Both sites are set in largely agricultural areas and adjoined Sites of Special Scientific Interest. A public right of way runs along the Kingsnorth sea defences.

Oak Weir Lock and a navigation dredging operation immediately downstream (undertaken from a barge) were inspected on the River Medway at Oak Weir (NGR TQ 654 472). The dredging was on a scenic stretch of the river that is regularly used by pleasure craft, particularly during the summer.

FIGURE 1

NRA LEIGH OFFICE, LOCATION MAP



Tree pollarding on the bank of the River Darent near Horton Kirby (NGR TQ 562 691) which was jointly funded with a conservation body was examined. The work was taking place on a public footpath and is considered 'high profile'.

2.2 Geology, Hydrogeology, Water Quality and Hydrology.

2.2.1 Introduction

In order to establish the potential for liabilities due to migration of contaminants onto the Leigh site, from adjacent contaminative uses, or away from the site onto third party land EAG Ltd completed desk-based research of the local geology, hydrogeology and hydrology. In particular they assessed the surface and groundwater sensitivities. The full report is in Annex 2; a summary is below.

2.2.2 Geology

The northern part of the site is underlain by Grinstead Clay with Ardingly Sandstone to the south. Both formations belong to the Tunbridge Wells Sand of the Hastings Beds series, Lower Cretaceous in age. Structurally the beds dip 5 - 10° northwards.

2.2.3 Hydrogeology

From the relative depths of the groundwater, the topographic fall of the area towards the south, and the location of the River Medway to the south, the predicted groundwater flow is towards the south.

The Tunbridge Wells Sand series of beds is classified by the NRA as a minor aquifer (a locally important aquifer) and the site is considered by the NRA to be located on the boundary between low and moderate groundwater vulnerability. Within 2km of the site lie four licensed groundwater abstractions, including a public water supply abstraction at Hayesden Pumping Station (1.4km south south west of Leigh office). The Source Protection Zone (SPZ) has not yet been modelled but the Leigh site is not expected to be within the SPZ.

2.2.4 Water Quality and Hydrology

The land falls away from the site towards the River Medway and is about 10m above the river level. The river lies about 250m to the south and is classified in the General Quality Assessment as class D (fair quality). Under the National Water Council classification the nearest upstream and downstream sampling points both achieved Class 1B "water suitable for potable supply abstractions; game or other

high class fisheries.”

2.2.5 Significance of Geology, Hydrogeology and Hydrology

The site is considered to be located in a moderately low sensitivity location with respect to the underlying aquifer type, the location of groundwater abstractions (distance and direction) and their respective uses.

The nearest groundwater abstractions are located up-gradient with respect to the predicted groundwater flow direction. The groundwater abstractions which are down-gradient, ie to the south, include a public water supply (Hayesden), which although considered a sensitive receptor, is located on the southern side of the River Medway. Therefore shallow groundwater which is predicted to be moving southwards from the site area, is likely to be intercepted by the River Medway, and unlikely to impact on the abstractions located further to the south.

It is expected that the shallow groundwater beneath the site is likely to be in hydraulic continuity with the river. It is considered that any mobile contaminants arising from the site area, and present in the groundwater, would represent a risk to the quality of the water in the nearby River Medway.

2.3 Site History

2.3.1 Introduction

The site history was researched for the NRA by EAG Ltd, by reference to Ordnance Survey and County Series maps, by referring to the site's planning history and other archive material. (Annex 2.)

2.3.2 Significance of Site History

The historical research has revealed that the site was in greenfield use up until the construction of the office and depot buildings in the 1980's. There is potential for contamination from the storage of fuel or oil at the depot, although the age of the site would provide some comfort.

The surrounding land uses have comprised former gravel pits which may have been infilled. If these have been backfilled with putrescible or industrial material this could provide a source for contamination of soil and groundwater. Further industrial activities were present to the north-east of the site, (a plastics factory, powder mill and chemical works) which could potentially cause contamination via migration onto the site. However, their distance from the site reduces the overall

risk.

We did not ascertain whether a pre-acquisition audit was carried out prior to purchase to verify the site's environmental status.

2.4 Site Operations

2.4.1 Site Layout and Description of Operations

The office site covers an area of approximately 0.4 hectares (0.9 acres) with a parcel of land used for grazing between the Medway and Powder Mill Stream of about 1.3 hectares (3.3 acres). The facility includes the following.

Office / Depot Complex Two main buildings, the southern containing the barrier operations room and the northern a garage/store and sample room. The southern building houses the district flood defence, navigation, licensing, water resources and environmental quality functions and the IBU staff operate from the northern building. Most of the remainder of the site is a tar-macadamed car parking area. Ancillary structures include three storage units, one without a floor, all on the tar-macadamed area, a standby generator with diesel storage tank, and a biological treatment works for sewage arising from the buildings.

Meadow Land An area of land forming part of the flood control reservoir.

Flood Defence Barrier An earth embankment about 8m high and 1.5km long with a concrete and steel construction hydraulic sluice gate spanning the river. The flood barrier sluice gate is used to regulate the flow of the River Medway. In the event of excessive flow the gates are closed to allow a large area west of the site to flood and hence protect the town of Tonbridge from flooding.

Pumping Station A brick built pumping station set in grazed land west of the main site. It pumps water from the Leigh village surface water drainage system into the flood reservoir when the barrier is in use.

3.0 MANAGEMENT

3.1 Introduction

Management aspects audited included the degree of understanding and commitment to environmental management by staff at all staff levels. Knowledge of NRA Environmental Policy was sought and the approach to its implementation and its objectives and targets examined. The resources allocated to environmental management were assessed. The managerial and administrative systems used to ensure implementation of best environmental practice were examined together with the production and promulgation of management procedures. The system for measuring, monitoring and reporting was audited.

3.2. Environmental Policy

Audit Criteria The NRA Internal Environmental Policy was agreed by the NRA Board in 1992 and communicated to all regions.

During the audit we found some awareness of the existence of the Environmental Policy amongst some of the managers, (ie from National H & S Week). However, no local managers had had any environmental objectives or targets passed to them. No specific action had been taken to achieve the required efficiencies on a functional basis. Whilst we found no system to co-ordinate any environmental actions on a site basis, the data necessary for the completion of the quarterly environmental performance return is being sent to the Regional Head Office.

3.3 Environmental Management System

Audit Criteria Key environmental management principles in the NRA Environmental Policy and best environmental management practice.

3.3.1 Site Management

At Leigh responsibility for the day to day management of the site is with the Area Business Services Manager at East Malling. The site is occupied by staff undertaking a range of functions, all reporting to managers elsewhere. The District Engineer undertakes a general responsibility and had kindly agreed to co-ordinate the audit at the site.

We found no specific site structure/organisation in place which details responsibilities, allocation of

authority and interrelations of key personnel in respect of the establishment and implementation of the NRA's Internal Environmental Policy.

With no manager at the site having overall responsibility, any co-ordination of effort is on the basis of "co-operation amongst tenants". Site security, for instance, is the responsibility of the last one out of the door. It was stated that this approach had not caused a problem.

3.3.2 Systems and Procedures

The NRA is seeking to implement environmental management by integrating it into existing management systems. It was reported that the NRA's Policies and Procedures were not held at the site. Staff reported having no procedures for dealing with pollution incidents and not having received NRA training.

Both parties (client and contractor) were unaware of the key environmental aspects of a contract (See Section 4.8.3). None of the managers spoken to had job descriptions. It was apparent that staff at Leigh were, and are, undergoing reorganisation largely associated with client/contractor split.

Management and staff were almost totally preoccupied with the changes and adapting to working with the new arrangements. Nevertheless, there was a recognition of the importance of sound environmental management and an encouraging amount of interest in getting it right. There were several requests for training in contract management and environmental management.

3.3.3 Recommendations

We recommend that:

- A manager at Leigh should be given specific responsibility for co-ordinating environmental performance and management measures at the site (and security/emergencies?) and for quality assuring management information returns. Functional performance remains with line management.
- Consideration be given to lending further support to ensure that the opportunity is taken to integrate the bare minimum of environmental management (ie waste minimisation and pollution prevention) into the development of the new systems and procedures required to accommodate the changes at Leigh.
- The Environmental Policy objectives and targets should, if not already done, be translated into specific Area targets that reflect the various site's particular environmental priorities and risks,

and be disseminated by Area Management to all functions.

- Job descriptions, when issued to managers, should include Environmental Policy implementation, as agreed by Directors.
- The environmental training needs of managers and staff should be reviewed.

3.4 Objectives and Targets

Audit Criteria NRA Environmental Policy objectives and annual environmental performance targets.

3.4.1 Implementation

There were no site specific environmental objectives and targets. There was some awareness of the need to save energy and recycle paper, but no knowledge of the overall NRA targets (15% energy reduction etc). Some employees had received Efficient Driver Training. However, there was a general lack of awareness amongst the managers as to the reasons or the objectives of the training.

There were no systems for monitoring and managing environmental performance. For example electricity meters were being read and recorded at the site, but the data was not being used by management at the site and there was no record of water consumption.

3.4.2 Recommendations

We recommend that:

- Site specific environmental objectives and targets should be developed and implemented that reflect the level of performance expected by the NRA and acknowledge the sites environmental priorities and risks.
- The waste minimisation targets (in particular energy) should be allocated, as appropriate, to all managers and incorporated into PRP.

3.5 Conclusions

The frankness of the management and staff and their willingness to assist and co-operate was most marked and appreciated by the audit team. Their interest in environmental issues should form a sound base on which to build continuous environmental performance.

A full description of best environmental performance is at Annex 3.

4.0 OPERATIONS

4.1 Introduction

Operational aspects audited included environmental performance and efficiency gains through effective resource management and waste minimisation measures. An assessment was made of the efficacy of the procedures to measure and monitor management processes and activities. Evidence of the inclusion in contracts (internal and external) of measures to ensure appropriate environmental standards was sought.

4.2 Energy Management

Audit Criteria The NRA Environmental Policy Target for energy consumption in buildings is a 15% reduction in energy use to be achieved by 31st March 1995 compared to 1991/2; measured in terms of CO₂ emissions.

4.2.1 Previous Survey

An energy and water use survey of the Leigh Office was undertaken for the NRA by the NIFES Consulting Group in March/April 1993. They found that in the year March 1992 to February 1993 189,538 kWh of energy (electricity and oil) were purchased at a cost of £7,427 with consumption calculated as 250 kWh/m²/annum. They identified possible savings in energy consumption of 65,106 kWh or 34% of energy use. (Table 1)

Table 1 NIFES Energy Survey Results

Occupancy	35	FTE
Floor Area	830	m ²
Electricity	83,538	kWh
Oil	106,000	kWh
Total Energy	189,538	kWh
Total Energy	7,427	£
Cost per floor area	8.94	£/m ² /annum
Total CO ₂	91.10	tonnes

Their main conclusions included the following:

- Electricity represented 44% of total purchased energy consumption but 82% of the total cost.
- Significant savings in oil consumption could be obtained by adjusting the main building time-

switch which allowed 24 hour heating, and replacement of the stores/workshop heating time-switch to allow the omission of weekend heating.

- Electricity savings were available from the replacement of GLS external lamps with compact fluorescent lamps.
- The thermal properties of the building were good but savings were available by ensuring doors were not left open, some with the aid of closer mechanisms.
- Housekeeping measures were good although further opportunities existed on space heating control.

The NRA Southern Region produced an action plan for all their locations that were inspected. Progress against those items identified for Leigh is attached. (Figure 2).

There are conflicting figures for the floor areas of the buildings at Leigh as outlined below. For the purposes of this report the area used will be that from the Lambert, Smith & Hampton Valuation of 647 m².

Table 2 Leigh Office Floor Areas

Data Source	Floor Area	
	m ²	ft ²
NIFES report	830	
Lambert Smith Hampton Valuation:-		
Office	527 [*]	5675
Lab, control room, switch-gear	119 [*]	1286
Workshop, garage	61 [†]	660

* Calculated from area in ft².

† Data used in this report.

4.2.2 Energy Consumption

The facility is connected to electricity and water only, with space heating provided by two oil fired boilers feeding radiators. Water heating to wash basins was by electric instantaneous heaters.

The consumption data for electricity is taken from records of the monthly bills received at the facility. (Figure 3). Authority staff make their own monthly readings, which were seen to agree with the billing information, but no detailed analysis was available from NRA staff to adjust for changes in site loads or space use. There was no information made available to facility staff to compare consumption with the Authority's performance targets. The gathered data is not used by the manager at the site.

FIGURE 2

Summary of Actions by NRA Southern Region on Recommendations in NIFES Energy Survey.				
Item Number	Description of Recommendation	Payback Period	Reported action 30/11/93.	Current Audit Findings
1	Ensure boilers are maintained at maximum efficiency	No cost	In progress	No documentation available at audit.
2	Reset main building time-switch to reflect occupancy	0.2 years	In progress	Switch observed to be set to continuous 24hr operation.
3	Replace stores/workshop time-switch to allow weekend omissions	1.7 years	To be complete by 31/3/94	Work observed to be not done.
4	Fit lock to fire exit door on main building	1.5 years	To be complete by 31/3/94	Not tested in audit.
5	Fit door closers to main doors of both buildings	4 years	To be complete by 31/3/94	Work observed to be not done.
6	Replace outside GLS lamps with compact fluorescent	8.4 years	Replace as lamps fail	No information available.

At the de-brief we were told that the recent boiler service, and overnight and weekend working due to the barrier sluice gate operation could have meant that the clock was overridden.

The facility have one bulk oil storage tank that is used to feed the standby generator, two heating boilers and to provide fuel for plant used off-site. There was insufficient data available at Leigh to allow any analysis of the amounts and efficiency of fuel use for space-heating.

4.2.3 Energy Conservation Action

No site staff member reported knowledge of any formal energy conservation programme. However, staff do try to reduce electricity consumption by turning off lights, computers, etc when not in use, and we observed that in general unused equipment, lighting, etc was switched off.

The NIFES recommendations for changes have, where checked, not been actioned.

4.2.4 Energy Analysis

- **NRA Target**

No overall comparison can be made of energy consumption against the Authority's target. However, the data for electricity alone is presented below.

Year	Consumption (kWh)	Change From Base Year (%)	Target (%)
1991/92	81,411	Base (0)	Base (0)
1992/93	83,731	+ 2.8	-5
1993/94	80,410	- 1.2	-10
1994/95*	78,212	- 3.9	-15

* March data estimated from 1993/94 figures.

The reduction in electricity consumed is insufficient to reach the NRA target. Although no data was available for the amount of heating oil used, the site could only reach the overall energy reduction target through a considerable reduction in oil consumption.

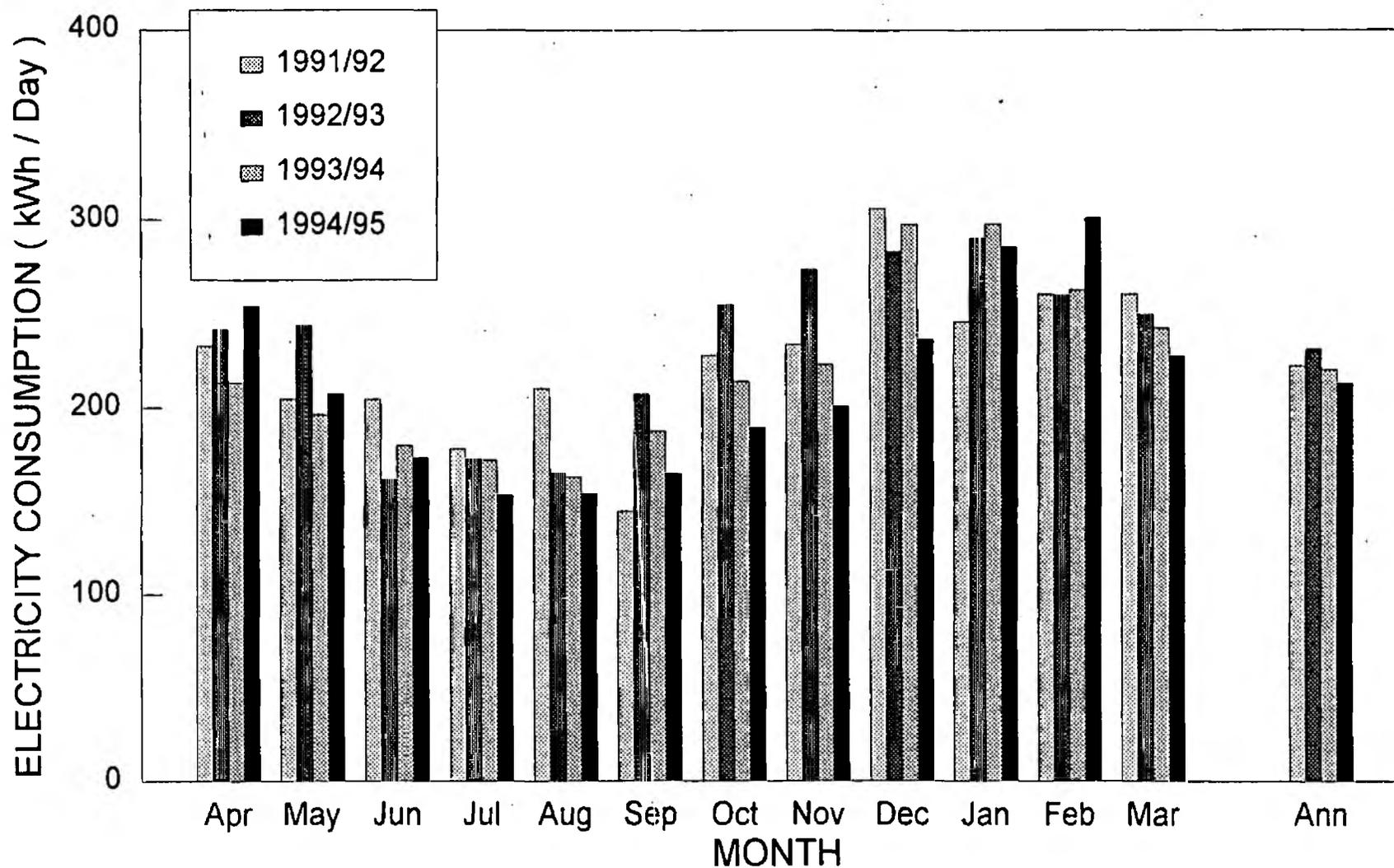
- **Efficiency of Use**

For the year ending 1/3/95 electricity consumption in terms of floor area was 122.3 kWh/m². The Energy Efficiency Office (EEO) figures for consumption, in a naturally ventilated open plan type office, give a typical electricity consumption of 85 kWh/m² and the Energy Saver

ELECTRICITY CONSUMPTION - LEIGH

Average Consumption per Day - kWh

FIGURE 3



publication produced by NIFES rates the present consumption in the very poor range warranting further investigation.

A comparison of the use of electricity during the day and night periods indicates that the facility has a high base-load. The lowest rate of electricity use during the night rate period was 47% of the average day use, with an average night value of 72%.

Table 4 Electricity Use (from billing information)

Consumption Period	Power Use	% of Average Consumption	Period
Average night rate consumption	7.25 kW	72%	(Apr 91 - Feb 95).
Lowest night rate consumption	4.75 kW	47%	(Aug 93).
Average day rate consumption	10.06 kW	100%	(Apr 91 - Feb 95).
Average overall consumption	9.24 kW		(Apr 91 - Feb 95).

The night time load may include heating pumps and boiler controls, security lights, refrigerators, vending machines, computers and the control room. The Energy Efficiency Office estimate that a typical night-rate use is about 10% of the day use, excluding computer suites, etc.

The excessive night use may, in part, be accounted for by the consumption in the control room.

- **Tariffs**

Electricity consumption derived from billing information from April 1991 onwards was examined. The facility is on SEEBOARD Economy 7 Maximum Demand Tariff with an available capacity of 35 kVA. A calculation of the cost or benefit to the facility of a change to the other tariffs available from SEEBOARD indicates, that at the present rate of consumption, there is no advantage to be gained by change.

4.2.5 Recommendations

We recommended that:

- The NIFES conclusions are implemented,
- Fuel oil use is metered to facilitate efficiency of use calculations, leak detection and cross-

charging of consumption.

- The excessive electricity consumption is identified.
- If feasible, the consumption by the control room is measured. If it represents a significant consumption, consideration is given to the necessity for its continuous powering.

4.3 Water Consumption and Costs

Audit Criteria The NRA Environmental Policy Target for water consumption in buildings is a 10% reduction in water use, to be achieved by 31st March 1995 compared to 1991/2.

4.3.1 Previous Survey

The NIFES survey reported that in the year ending February 1993 the facility used 151m³ of water at a cost of £268. To reduce consumption they recommended the installation of WC dams (saving 25m³) and fitting tap restrictors to the wash hand basin taps (saving 7m³). In the action plan prepared the WC dams were to be installed by the end of the 1993/4 financial year but the tap restrictors were not to be fitted.

No information was made available as to the current rate of water consumption. The site staff do not read the water meter themselves nor were they aware of the amount used.

4.3.2 Recommendations

We Recommend that:

- Facility staff are made aware of the actual consumption taken from the site's meter and the efficiency of water use is monitored. Best practice is for meters, for all utilities, to be read weekly.
- Procedures to investigate anomalies are written and promulgated.

4.4 Transportation

4.4.1 NRA Target and Audit Criteria

Audit Criteria NRA targets - an all diesel badged fleet with a target of 90% by year end 1994/5, and a 15% reduction in energy consumed by year end 1994/5 compared to a baseline of 1991/92. NRA policy; industry best practice, including systems to minimize vehicle use (car sharing, route planning,

journey elimination, etc), driver training, and correct vehicle specification.

4.4.1 Leigh Site Performance.

The use of plant and boats and the associated environmental impacts are considered in Sections 5.7.2 and 5.7.3. Vehicle maintenance is in Section 4.5.4.

Fuel Monitoring We were advised that all badged vehicles operating from the site are diesel. We found that managers did not monitor fuel consumption and staff were not informed of their vehicle fuel consumption. No specific action had been taken to reduce fuel consumption.

A new transport management system is being installed and we were told that it will provide managers with vehicle fuel consumption figures.

Route Planning We found no system in place to monitor and manage the totality of the essential mileage driven by staff.

Efficient Driver Project The Efficient Driver Project (EDP) requires commitment, support and active monitoring by management. There was a very low level of awareness as to the objectives of the project. The video and briefing had not been seen by managers, although some subordinates had received the training. Accident figures were kept at Regional Head Quarters and it was stated that they had not been made available at the site.

Tyres Remould tyres are routinely fitted to the rear of lorries and trailers. Such recycling is to be commended.

Boats No staff member interviewed was aware of whether any procedures had been issued on the refuelling or maintenance of boats on the water.

4.4.2 Recommendations

We recommend that:

- Data from the new transport management system should be actively managed and provided to all drivers.
- All managers and staff at the site are briefed, hierarchally from top to bottom, on the objectives and benefits of the efficient driving project.

- The use of recycled tyres should be extended, subject to safety.
- Procedures for the refuelling of boats should be written and promulgated to appropriate staff.

4.5 Procurement, Suppliers and Contractors

Audit Criteria NRA Policy - suppliers of products and systems should produce evidence of their positive environmental management.

4.5.1 Introduction

NRA staff and managers based at the Leigh site control very few contracts and procurement decisions. Most are undertaken at an area or regional level and were not considered in this audit.

4.5.2 Service Suppliers

The Area Business Services Manager is responsible for all aspects of contracted services for the Leigh site. These chiefly comprise the contracts for grounds maintenance and cleaning. Leigh office has no on-site catering contract.

We were not able to review copies of the contracts for their environmental content. None were available at the Leigh office.

From our visual inspection of the site we found no evidence that peat is used on site. This is in line with the NRA policy.

4.5.3 Materials Suppliers

Office materials were reported to be purchased from the national supplier (Chapmans) and all new materials we examined were from their range. The national contract includes environmental considerations. We observed that stocks of liquid paper based on the solvent 1,1,1-trichloroethane were still held. Copier and printer paper was purchased from Chapmans and was labelled as 'woodfree' from a sustainable source. However, it does not comply with Authority policy for paper to include 40% waste, grade C & D.

4.5.4 Contractors - Vehicle Maintenance

NRA badged vehicles are maintained by local garages. The Plant and Service Co-ordinator visits these

garages and relies on his experience to check their compliance. No specific checks are made as to whether the garages are disposing of tyres, oil, anti-freeze etc, in accordance with the Duty of Care.

4.5.5 Recommendations

We recommend that

- Paper is purchased in accordance with NRA policy.
- No ozone depleting 1,1,1-trichloroethane based liquid paper is purchased.
- Supervisors are issued with an inspection check list to ensure environmental compliance by NRA contractors servicing our vehicles.

4.6 Emergency Procedures

Audit Criteria Best industry practice and guidance given by NRA to outside organisations, for example PPG 18 Pollution Prevention Measures for the Control of Spillages and Fire fighting Run-Off.

We could find no evidence of any procedures to cover on-site emergencies/spills etc.

We recommend that:

- Emergency procedures should be promulgated.

4.7 Waste Minimization

Audit Criteria Best industry practice, NRA Internal Environmental Policy priority issue.

The staff knew of no formal waste minimization scheme for the facility. However several, individual initiatives had been made.

- Double sided photo-copying was generally used but there was no knowledge of the quantity paper used to allow the effective management of consumption.
- Copier / printer paper used was 75 gsm, which is lower weight than is normally used in the Authority. This is to be commended.
- Only small quantities of stationery were kept, to discourage use and abuse.

4.8 Off-Site Activities - Operational Aspects

Audit criteria; best industry practice - the incorporation of environmental criteria in working procedures and practices.

4.8.1 Introduction

A number of off-site activities were examined from Leigh. These include;

- Water Resources - Maintenance of gauging stations.
- Flood Defence - Capital projects and maintenance.
- Flood Defence - Operation of pumping station.
- Navigation - River navigation maintenance.

The environmental impacts of the off-site activities are covered in Section 5.7.

4.8.2 Water Resources - Gauging Station Maintenance

The maintenance of the Kent Area gauging stations was, at the time of the audit, undertaken by water resources staff. The work is to be transferred to contractors from the new financial year. Inspection of the NRA sites and of the contractor's work is undertaken by staff at Leigh. Staff interviewed received no specific instruction about the environmental aspects of the contractors' work, although their degree of awareness on ecological issues was very high.

The new maintenance contract was not available for examination, but an annual inspection checklist for gauging stations was examined. We found it very comprehensive. However, the application of environmental best practice for the maintenance of stations is not included and is left to the individual staff member.

4.8.3 Flood Defence Operations

The operational aspects of the flood defence work investigated are identified as;

- waste minimization,
- the inclusion of suitable standards in contract specifications, and
- control and monitoring of contractors.

Waste Minimization The stone used at Kingsnorth was found to be of a poor standard by operatives.

This poor quality control results in waste, the undersize stone is used to reinforce the toe of the bank in excess of that required by the contract. The stone had recently been delivered by barge to avoid damage to the earthworks. This is commended for the environmental gains through reduced use of energy in transport and reduced nuisance caused by traffic.

Contract Specifications The contract documents examined by the team appeared comprehensive in incorporating appropriate environmental standards. Extracts from the Flood Defence Maintenance Contract are in Annex 4. They cover refuelling, storage, spillage and timber treatment, and indicate that the drafter had consulted or was aware of the Authority's Pollution Prevention Guidance Notes. This approach to contract specification is to be commended.

Contractors' Performance The NRA Contractor was responsible for the servicing of plant. The Plant and Service Co-ordinator had seen the contract but a copy was not available on site. He believed that clauses on spill prevention were in the contract. He said that spill absorbent material had been seen with plant but was not normally checked. There was no record of spills. The Flood Defence Maintenance contract states that fuel and lubricants must be moved in a bunded pallet (See Annex 4). Neither the contractor nor the client were aware of this requirement.

In general, improved awareness of legal requirements and good environmental practice is required (e.g. the Pollution Prevention guidelines) within NRA engineering staff involved in letting contracts, monitoring of contractor performance and guidance to contractors. This will enable NRA engineers to have the expertise to advise over and above the contractual specifications and on-site specific issues as they arise.

4.8.4 Flood Defence Pumping Station

The pumping station at Leigh consists of two electric pumps which had run a total of 592 and 286 hours respectively since the barrier was constructed. A night tariff meter was fitted and the tariff changed to 'Economy Seven Business' in June 1993.

The lack of any flow metering prevent our commenting on pump efficiency. The control system is simple, consisting of two probes, and the possible benefit of more sophisticated controls for a pumping station with such comparatively low use is not considered by us.

There is no national guidance available on operating pumping stations on 'day and night' tariffs, although this is financially sound. Practice is determined in each region.

4.8.5 Recommendations

We recommend that:

- Staff are given suitable instruction in the likely environmental effects of the operation and maintenance of gauging stations.
- Delivery by barge is used where practicable.
- The amount of waste resulting from low quality materials should be quantified, and if significant action taken with the supplier.
- The incorporation of high environmental standards into contract specifications should be general practice in the NRA.
- Night tariff meters should be part of the design specification for pumping stations.

5.0 ENVIRONMENTAL IMPACTS

5.1 Introduction

Possible environmental impacts are assessed. Emissions and waste streams are identified together with the existence of permits or consents for the discharges. Compliance with statutory controls on emissions are assessed together with compliance with NRA best practice as given to outside bodies. Implementation of best practice above that required by national procedures is sought for use as examples by other Areas or regions. The effectiveness of measuring and monitoring of discharges, whether controlled by statute or not, is appraised.

5.2 Land Use and Maintenance

Audit Criteria Best industry practice, for example as outlined in Welsh Water's "Making the Most of Your Site." NRA Guidance in The New Rivers and Wildlife Handbook.

The appearance of the barrier is stark; there is no tree planting to obscure and soften the visual impact of the barrier. (Picture 1) The meadow land was reported to be grazed by sheep during the summer and we observed it was closely cropped. The manager of the adjoining country park had noted that the grass on the barrier did seem to be kept short, but understood that there were operational reasons for this. There is a tree planting scheme in progress at the northern end of the barrier with an area of trees being grown on prior to possible transplantation. (Picture 2)

There is no land management scheme in place for the site.

In view of the cramped nature of the main site there is little prospect of enhancement to the visual and aesthetic appearance of the site. However, we recommend that:

- Where possible further trees are planted to screen the site and barrier and to improve its appearance.
- A landscape management scheme is developed for the office site and barrier, in consultation with the Country Park management.

5.3 Air and Noise

Audit Criteria Legislative requirements, Clean Air Act 1993, Environmental Protection Act Part III, 1990 - statutory nuisance.



Picture 1 Leigh Barrier earth embankment south of main river course, showing starkness of structure.



Picture 2 Leigh Office and barrier with Powder Mill Stream in foreground. A - sewage treatment plant; B - sewage outfall; C - land drain; D - tree planting scheme; E - Leigh Office.



Atmospheric emission sources comprise;

- two 'domestic' oil fired boilers,
- one standby generator.

The regulation of emissions to atmosphere from this site does not come within the scope of the Environmental Protection (Prescribed Processes and Substances) Regulations 1991; regulatory control rests with the local authority provisions regarding nuisance. It is considered that the risks of nuisance emissions arising are small.

The operations undertaken at this site are not inherently noisy and the location of the buildings some distance from housing make it unlikely to present a significant potential for noise nuisance.

5.4 Water and Wastewater

Audit Criteria legislative requirements, eg Water Resources Act 1991, section 24 (abstractions) and section 88 (discharges) and relevant Statutory Instruments. Advice by NRA to outside bodies, eg Pollution Prevention Guidance Notes and Pollution Prevention Pays video.

5.4.1 Water Abstraction

There is no abstraction of water at this site.

5.4.2 Wastewater

Wastewater discharges comprise;

- foul drainage from toilets, kitchen, etc,
- boiler draindown and air conditioning unit condensate, and
- storm-water drainage.

Site Drainage These wastewaters discharge via a variety of routes; the drainage plan available for inspection was not up to date, therefore the exact drainage routes were not identified. We were pleased that most inspection chamber covers on the surface and foul water systems had been colour coded red for foul water and blue for surface water. This was undertaken some time previously and the directional indicators are now haphazard and the colours are fading: -----

Discharges to Sewer Effluent arising from toilets, wash basins, kitchen areas and the sink in the sample storage area discharge to a self contained sewage treatment plant located within its own compound just outside the site perimeter. The treated sewage effluent discharges via a piped outfall to the nearby Powder Mill Stream. An application for consent was submitted to the Department of the Environment in 1989/90. Although a reply had not been received at the time of the audit we are now advised that the documentation has been returned by the DoE. The discharge is now formally consented with quality conditions of 60mg/l suspended solids and 40mg/l BOD and a volume condition of 4m³/d.

The treatment plant is a small biological "off-the-shelf" package unit or "Bioclere" which is designed to produce a treated effluent acceptable for discharge to a watercourse. No information is available on the quality of the effluent discharged and we found no monitoring programme in place. Similarly there is no information on plant maintenance.

Discharges to River The only discharge to the river from the site, of which we are aware, is the treated sewage effluent referred to above. (Picture 1)

Discharges to Groundwater The site is located on clay overlying sands and sandstones which represent a minor aquifer; surface water from the site is thought to discharge to a soakaway and the risk presented by the site is moderately low bearing in mind the "low key" activities on the site. This risk could be further reduced by fulfilling the recommendations of this report.

There is no evidence to suggest an oil separator is installed in the surface water system. In view of the vehicle movements, and in particular the variety of oils moved around the site we believe one is required. There is one air conditioning unit on site and the condensate from this is vented to the ground.

5.4.3 Recommendations

We recommend that:

- An accurate drainage plan is produced. The drainage plan supplied indicated that surface water is directed to soakaway but there is also a suggestion that some may pass to the river.
- The colour coding system is extended to all inspection chamber covers on site as recommended in the NRA Pollution Prevention Guideline No. 18 "Pollution Prevention Measures for the Control of Spillages and Fire Fighting Run-Off," section 4b, and the "Pollution Prevention Pays" video.

- A more durable paint is applied to the inspection chamber covers.
- The surface water drainage is clarified.
- All surface water gulleys should be clearly identified and all rainwater downpipes sealed at ground level to remove the risk of contamination; as given in Pollution Prevention Guideline No. 11 "Preventing Pollution on Industrial Sites".
- A programme of sampling is developed and implemented to monitor the efficiency and compliance of the sewage treatment plant and a maintenance schedule is put in place as advised in Pollution Prevention Guideline No.4 "Disposal of Sewage where no Mains Drainage is Available".
- A suitably designed oil separator is installed in the surface drainage system, in accordance with Pollution Prevention Guideline No.3 "The Use and Design of Oil Separators in Surface Water Drainage Systems".

5.5 Environmentally Hazardous Substances

Audit Criteria NRA Environmental Policy for the elimination of toxic substances and emissions where practicable. NRA policy on the elimination of ozone depletors. NRA Guidance in Pollution Prevention Guidelines and in "The Use of Herbicides in or Near Water."

5.5.1 Introduction

A wide range of environmentally hazardous substances, especially oils including gas oil, hydraulic oil, and waste oil are stored on the site with small volumes of other liquids including disinfectant, battery acid, and solvents. Details of all substances stored are contained in the Southern Region COSHH sheets which are collected together in an A5 booklet available to personnel. The environmental impacts associated with environmentally hazardous substances used off-site is covered in Section 5.7.

5.5.2 Storage

Liquids are generally stored in four locations;

- the generator house,
- the oil storage tank bund and environs,
- the water quality garage at the rear of the northern building,
- the Portastores and hut close to the eastern perimeter of the site.

- **Generator House**

Generator Tank The standby generator, which supports some of the electrical services in the offices and provides the back-up power for the flood control gates associated with the nearby flood barrier, is situated within its own building adjacent to the northern building. As well as housing the generator set there is also a small oil storage tank which is filled from the main external tank and acts as the service tank for the generator. This tank (approximate volume 220 litres) is not labelled and does not have an associated bund compound.

Oil drums Also stored within the generator house were seventeen 25 litre drums of various oils in two locations; neither area is protected against spillage. Although the floor coating, which is probably oil resistant, is extended for a short way up the side walls thus sealing the join between wall and floor, there are several ducts laid within the floor carrying electrical cables and pipe-work; these are vulnerable to spillages within the building and may not be properly oil proofed. Furthermore, there is no barrier across the doorway to prevent any spillage within the building from running outside.

Oil Supply The underground oil supply pipes for the two boilers radiate out from the generator house and are probably not in ducts which would allow inspection. Fuel usage is not metered nor routinely monitored and consequently any leakage in the pipe-work would be difficult to detect. (see also Section 4.2.2)

- **Oil Storage Tank Compound**

Bulk Oil Tank The bulk gas oil storage tank serving the site is located adjacent to the generator house with one wall of this building acting as part of the bund compound. The tank serves the generator, two oil fired boilers one located in each office building, and also provides a refuelling facility for off-site plant. The tank has an approximate capacity of 9,500 litres, and is surrounded by an adequately sized brick built bund compound which is rendered internally on all four walls, but this render may not be oil proof. The tank itself bears a label describing its contents but there is no advisory label showing spillage arrangements, and the outlet control valves are not locked; the delivery point is located within the bund area, and, although fuel deliveries are always supervised, the vent pipe location will allow spills caused by over-filling to escape from the bunded area.

Bund Compound There is a small sump in one corner of the compound to allow the removal of accumulated rainwater but there is no pump permanently mounted to allow rainwater to be

decanted off. There is also a small bore plastic pipe installed through the bund wall adjacent to the sump with a screw cap on the outside which is easily removable. Also located within the bund compound is a metal cabinet containing the refuelling pipe and fuel meter which are served by an electric pump; at the time of inspection this cabinet was not padlocked and the doors were held closed by a piece of metal, however, a padlock was subsequently put in place. The cabinet, which was recently relocated inside the bund, is sited too close to the containment wall; any spillage from within the cabinet would flood over the small lip at the front of the cabinet and then over the bund wall. (Picture 3)

Compound Environs Outside the bund compound, but adjacent to it, are stored several oil storage drums which were mainly empty. The drums are not located within a containment area and nearby is a rainwater downpipe which is not sealed at ground level. We were told that up to twenty 45 gal drums may be held in this area for the disposal of waste oil collected following pollution incidents, and temporarily stored on the site prior to removal by contractor. We were unable to clarify whether the same drums are used to transfer clean fuel and waste oil. The drums are not labelled. These inadequate pollution prevention measures are also commented upon in a regional pollution prevention report prepared in 1993. (Pictures 5 & 6)

We were also informed that other drums may be used to transport gas oil supplied from the main storage tank to off-site locations for refuelling operations. Also located in this area against the back wall of the garage is a locked cage for the storage of small containers of fuel used to run various pumps and generators stored in the water quality garage. The possible impacts of refuelling off-site are considered in Sections 5.7.2 and 5.7.3.

- **Water Quality Garage**

As well as small items of plant there are some small quantities of liquids stored in this building, notably 25 litre containers of disinfectant, which are not stored in protected areas. Adjacent to the garage is a small sample collection room which houses refrigerators to store samples and various other sampling items including bottles with reagents. These are all labelled and present negligible risk.

- **Portastores**

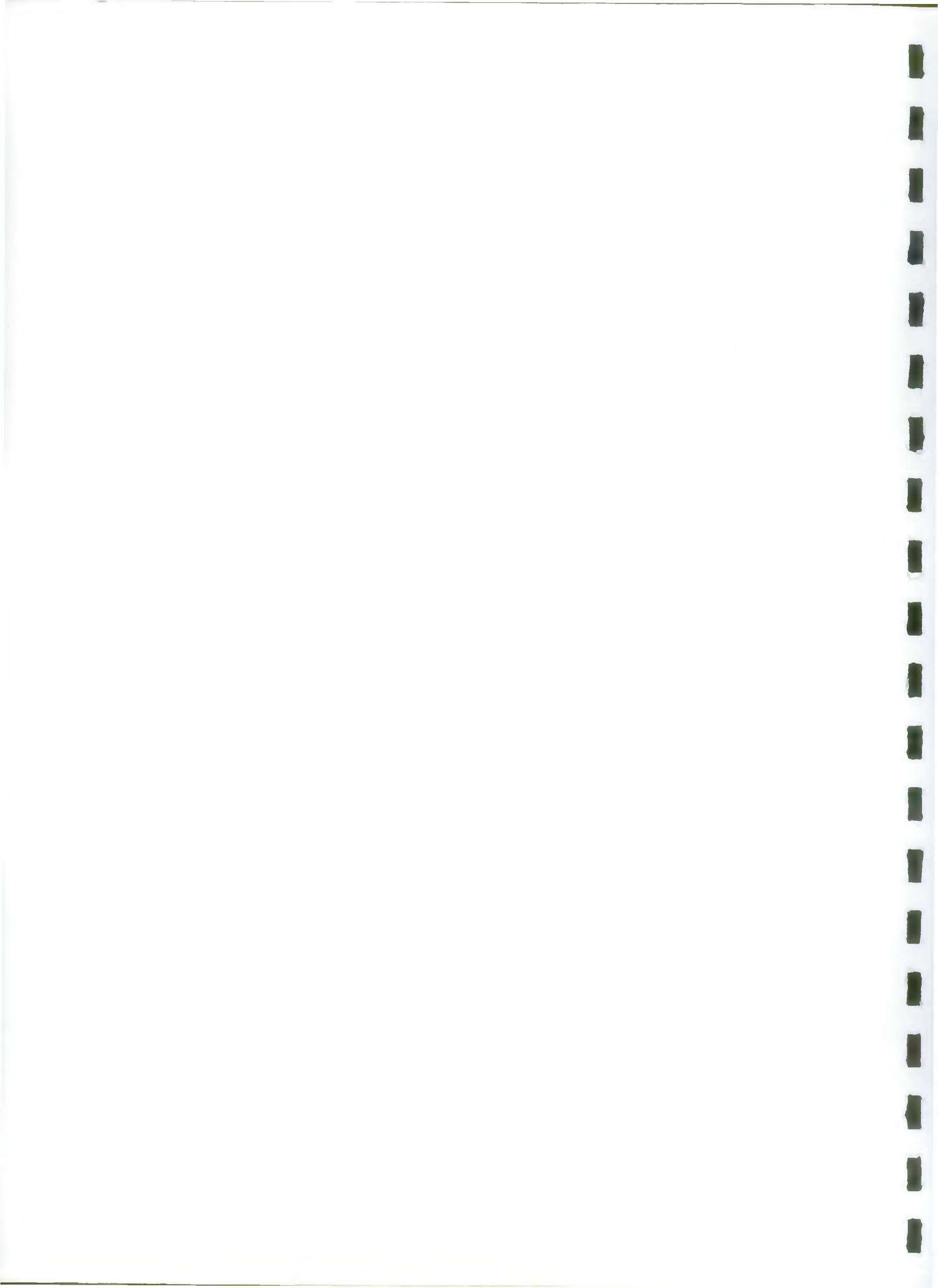
There are two connected Portastores and a small metal hut (which has no floor), located by the perimeter fence at the eastern end of the site near the northern building and used by the



Picture 3 Leigh Office bulk oil tank bund. A - rain water drain through bund wall; B - fuel dispensing cabinet; C - bund wall.



Picture 4 Leigh Office storage hut placed directly on tar macadamed surface. A - drums of oil; B - hazardous chemical store.





Picture 5 Leigh Office fuel dispensing area and drums stored alongside bulk oil tank. A - fuel dispensing point; B - unsealed rain water downpipe; C - oil drums.



Picture 6 Leigh Office unbunded store area alongside Portastore building. A - marks due to oil spillage and drums.



flood defence workforce for storage of all types of equipment. There are several 25 litre drums of various oils kept within these stores without any form of protection. Additionally, lead/acid batteries are also stored on the floor in vulnerable positions. Although these stores are kept locked when not in use, any spillage within the stores would be difficult to contain and could contaminate nearby surface water gullies. (Picture 4)

5.5.3 Recommendations

We recommend that:

- A contingency plan for the site is put in place to deal with any hazardous substance release. (See also Section 4.6)
- All forms of storage comply with the requirements of our own pollution prevention guidelines, including securing all polluting liquid storage facilities, and especially improving drum storage facilities.
- The bulk oil tank vent pipe location is adjusted so that any oil surcharging via this route is directed over the tank and not towards the bund wall.
- The bulk oil tank bund drain outlet is permanently sealed.
- Guidance given in Pollution Prevention Guideline No. 2 is applied to the oil storage tank within the generator house.
- Drums of oil in the generator house are located within a protective bund area as specified in the Pollution Prevention Pays literature and Pollution Prevention Guideline No. 11.
- Drums stored outside, eg near the bulk oil tank are banded, in accordance with PPG 11.
- All drums are adequately labelled or colour coded according to their contents or use.
- The underground fuel system is routinely tested to ensure its integrity and fuel oil usage to buildings and plant is monitored to facilitate leak detection.
- The fuel delivery cabinet is moved further into the compound, or slots are cut in its floor, to allow any escape of oil in the event of an accident, to fall directly into the banded area.
- The Fuel delivery cabinet is kept locked when not in use.
- Consideration is given to the consequences and containment of spillages within the generator house itself.

5.6 Waste Management

Audit Criteria Duty of Care for the Disposal of Waste, NRA PINs SC/CC/013 and OP/EM/011, best industry practice for the disposal of waste - reduce, reuse, recycle.

5.6.1 Waste Sources

Wastes arising at the facility were identified in the audit and are given in Table 5.

	Waste Description	Source	Storage - on Site	Disposal Route
1	General wastes	All of Site	Covered Skip	Landfill - R Biffa Ltd
2	Paper	Offices	No specific area	Courier to Regional Head Office - recycled
3	Drinks cups	Vending machine	Container by machine	Save-a-Cup recycling scheme
4	Print cartridges	Printer / copier	New supplier will take back - no details available	
5	Pollution control materials	Kent District; brought to site in NRA vehicles	Covered skip (1) used for general waste	Landfill with general waste
6	Collected pollutants (Drums etc)	Kent District; brought to site in NRA vehicles	Stored loose near generator house	Landfill and / or for recycling

5.6.2 Disposal Practice and Compliance

General Waste General rubbish is deposited in a covered skip located in the south west corner of the car park; the area around the skip was clean and tidy. The waste is removed as required by a skip lorry operated by the IBU and disposed of at the Shakespeare Farm site operated by Biffa Waste Services Ltd. The waste is described as "General Rubbish - Industrial" on the Waste Transfer Notes for the period September 94 to February 95.

Paper and Drinks Cups Waste paper and used drinks cups are recycled from the facility. The amounts are small given the size of the facility and no waste documentation is raised. There is unlikely to be a need for such documentation in view of the "trivial" quantities concerned.

Print Cartridges A new system for returning used print cartridges to the supplier for recycling is to be implemented. No details of the documentation likely to be required are available but because of the "trivial" quantities is unlikely to be needed. The supplier should be able to supply details.

Pollution Control Materials Oil contaminated absorbent material collected following pollution incidents is disposed of in the skip but is not recorded on the Waste Transfer Notes and is not, apparently, treated as special waste as specified in PIN OP/EM/011.

Collected Pollutants - Oil Waste oil is also collected on the site and is removed by specialist contractors for disposal at an approved site. Waste Transfer Notes (as specified in PIN SC/CC/013) were not checked.

Collected Pollutants - Chemicals We were told that a chemical drum of unknown contents was recently recovered by NRA staff and transferred to the site. It was removed from Leigh by Cory Environmental in an ordinary Transit van. The Waste Transfer Note was completed on the basis of a "sniff" test and the drum's contents declared as trichloroethylene. No laboratory test was made to confirm this and to identify any other substances present.

5.6.3 Waste Disposal Contractors

Waste disposal contractors are used at the site and at pollution incidents. They are selected on the basis of being "recognised". We found no specification for waste disposal contractors and no approved list. There was no report of any audit being carried out on a contractor removing waste from the site.

There was no policy on the type of waste disposal facility to be used by waste contractors.

5.6.4 Procedures and Training

We were told that there were no formal procedures for remedial action at pollution incidents, nor had staff been given any training other than by suppliers of specialist equipment. Individual's training records were not made available to us to verify this. It was stated that new staff were shown by colleagues how to deal with incidents.

5.6.5 Recommendations

It is recommended that:

- Procedures are issued to pollution control staff on remedial action at pollution incidents that reflect environmental best practice and have a regard for health and safety.
- An approved list of waste disposal contractors is produced for use at incidents.

- Training is given to appropriate staff in procedures for the handling and disposal of waste hazardous chemicals.
- The handling of waste at the site (and at incidents) is reviewed to ensure compliance with the Waste Disposal Duty of Care.
- The NRA Conditions of Contract for the Disposal of Waste are applied to the disposal of site waste.
- The disposal of site waste is regularly audited.
- The NRA considers a policy on the final disposal of waste from NRA sites to ensure best environmental practice.

5.7 Off-Site Activities, Environmental Impacts

Audit Criteria Relevant criteria from earlier sections, viz Waste Disposal, Environmentally Hazardous Substances, Transport, and Land Use.

5.7.1 Introduction

There were four off-site locations inspected during the audit; three maintenance operations carried out by the Flood Defence Internal Business Unit, and a maintenance operation carried out by in-house personnel.

- Dredging operations on Yantlet Creek, Isle of Grain (Flood Defence).
- Stone Pitching, Kingsnorth, Isle of Grain (Flood Defence).
- Tree pollarding on R. Darent, Horton Kirby (Flood Defence).
- Dredging operations below Oak Weir, R. Medway (Navigation).

The environmental impacts at Water Resources' gauging stations was assessed through discussions with staff at the Leigh office.

5.7.2 Flood Defence Operations

The most significant environmental impacts of the flood defence operations, disregarding ecological effects, were identified as;

- waste disposal (spoil, weed cuttings, tree cuttings),
- statutory nuisance (noise, smoke), and
- spillage (refuelling, hydraulic leaks, biocides).

- **Yantlet Creek**

Waste Disposal Waste arising from the land-based dredging works is deposited on the bank within one throw of the excavator, about three to four meters from the water course. This spoil is exempted from control as 'Directive Waste' by the Waste Management Licensing Regulations 1994.

Spillage - Refuelling Refuelling the land based excavator is from a 45 gallon drum (coloured green) which, due to ground difficulties at the site, was transported behind an agricultural tractor; normally it is moved by Land Rover. It appeared to lack any containment. At the site the drum is moved in the bucket of the excavator which is refuelled by an attached pump drawing from the drum. Although refuelling should be carried out away from the river, as specified in the contract document, under these circumstances it is difficult to afford total protection against the event of a spillage. No absorbents are kept at the site and no spill procedure is available. (Picture 7)

Spillage - Hydraulic Fluids Escapes of hydraulic fluid from excavators were reported to occur very occasionally, despite regular maintenance and checks. In the event of an escape the operator immediately shuts down the plant. Whilst it is accepted that leaks are an inevitable problem associated with hydraulic plant, the use of bio-degradable oils will reduce the environmental impact.

Spillage - Herbicides Herbicides are used to kill reeds growing in spoil, if the occupier of the land so requires. We made no observations as to the types used and the procedures for their control.

- **Kingsnorth**

Spillage - Refuelling Plant was not present during the audit but was recently used. Operatives reported that fuel is moved in a trailer or the rear of a truck but did not state if it was contained. Drums are left on site and there is a potential problem with escapes caused by vandalism. Jerricans are used to fill small plant with the risk of small spills, estimated by staff at a maximum of a pint. No absorbents are kept and no spill procedures are available.

- **River Darent**

Waste Disposal On the bank of the River Darent pollarded tree material in the form of logs



Picture 7 Dredging at Yantlet Creek. Note the fuel oil drum carried in the excavator bucket.



Picture 8 Dredger "Bourne 2" on the river Medway below Oak Weir. A - fuel oil drums carried, unsecured and unbanded.



is stacked on the bank side to create habitat diversity. The bank had recently flooded. The stacks, some of which are unstable, are secured with thin wire that is already rusting. There is a probability of the logs becoming loose and being carried away to become debris. The excess brush and discarded materials are burnt on site; the total quantity did not exceed 10 tonnes per day in one location and is, therefore, exempt from waste regulation control.

The team were keen to demonstrate their knowledge of conservation and wildlife issues, and to discuss environmental matters.

Statutory Nuisance The occasional use of a chain saw (noise and smoke) and the burning of brush in a particular area is unlikely to cause a Statutory Nuisance. The use of bow-saws for cutting small branches can achieve a reduction in the environmental impact. This is more convenient, comfortable and less noisy to the operatives and neighbourhood than the tendency to always use 'easy' mechanical means. (Picture 9)

Spillage - Refuelling At the tree pollarding site fuel and oils are carried to the site in the rear of a Land Rover; they are transported in plastic containers which are refilled from stocks at base. The quantities involved are small and the resultant risks from spills are reduced. There are no oil absorbents available on site.

Spillage - Chain Oils The experienced supervisor identified the oils from their differing viscosities. It was not always apparent from the container. The operatives did not know whether the chain saw oil was biodegradable. Sawing was taking place over and immediately adjacent to the river.

5.7.3 Navigation Operations

Waste Disposal At the Medway dredging site excavated spoil is stockpiled on the adjacent river bank prior to some of the material's use to improve local farmland and roads. At other sites where deposit on the bank is not possible we were told that the material is stored within the dredger and then barged to a disposal site. On occasions spoil from the hold was deposited at a gravel pit. We could not clarify the status with respect to the application of the Duty of Care for the Disposal of Waste. (Picture 10)

Refuelling The Medway dredger "Bourne 2" is refuelled from two yellow and black 45 gallon drums mounted on decking just by the wheelhouse. There is no protection around the storage area should a spillage occur, and the drums were not secured; finally, although specified in the contract document,



Picture 9 Tree Pollarding on the River Darent at Horton Kirby. Use of chain saw in immediate vicinity of river.



Picture 10 Dredging from "Bourne 2" on the midway below Oak Weir. Spoil is deposited on the river bank.



oil absorbents were not seen to be kept on the vessel. (Picture 8)

5.7.4 Water Resources Gauging Stations

Waste Disposal We were told that the small quantities of waste collected at the sites during inspection and maintenance are removed by the operators and taken to the nearest local authority waste disposal facility. No documentation is raised, and no fees are paid, the waste is treated as 'domestic'. Part used paints, etc are returned to the depot for re-issue.

Environmentally Hazardous Substances Staff reported that the paints and creosote used at the stations are chosen mainly for durability. Environmentally more acceptable paints had been used but are not regarded as satisfactory and alternatives to creosote are under trial. The NRA has taken action against British Waterways for the use of creosote on its canal structures and although the site does not use creosote on timbers that come into contact with water its use near the water course gives rise to a potential for pollution.

Herbicides are not used at gauging stations.

5.7.5 Recommendations

It is recommended that:

- Waste from the dredger and gauging stations is properly documented and disposed of according to the Environmental Protection Act, Duty of Care Regulations.
- Fuel is transported to sites by bowser or banded pallets in all but the most exceptional conditions.
- The fuel drums on the dredger are secured and adequately banded, and spill absorbents are carried.
- The containers of fuel, oil, and lubricants are colour coded or clearly labelled.
- Spill procedures are produced, briefed to staff, and displayed in plant and vehicles where practicable.
- Spill absorbents are carried on plant that refuel on site. In all but the most exceptional cases refuelling is carried out away from the water course, in accordance with PPG 5 and the contract specifications.
- Rapidly biodegradable hydraulic fluids are used in NRA plant, subject to the findings of the project in Northumbria and Yorkshire.
- The use of biodegradable oils for chain saws is adopted.

- Paints and timber preservatives are chosen with regard to their environmental impacts.
- The use of herbicide near watercourses is avoided if possible. If the landowner requires its use, it must be used in accordance with the NRA guide "The Use of Herbicides in or Near Water."
- The method of stacking and securing logs is reviewed.

ANNEX 1

LIST OF DOCUMENTATION REQUESTED

TO BE MADE AVAILABLE

AT THE START OF THE AUDIT

PREPARATORY REQUEST FOR INFORMATION

Date of Audit:

Please have the following available for inspection on the above date.

NB: Not all will be relevant to your operation, please cross if not applicable

INFORMATION	Available/ Not Available/ Not Appropriate (✓/x/ NA)
SITE DETAILS	
Site location plans (in relation to main roads etc.)	
Detailed plans of:	
site layout (past and present)	
buried services (pipes, drains, sewer, and oil interceptors)	
underground storage tanks, sumps, pits	
surface chemical and oil storage	
Development history and any description of past processes, land use or occupants	
Past reports on:	
environmental monitoring	
integrity testing (underground tanks)	
ground engineering reports (borehole record, etc.)	
MANAGEMENT DETAILS	
Management Structure Plan	
Quality Assurance and other operational documents	
Employee training records and job descriptions	
Environmental management documents:	
regulatory authority correspondence	
internal/independent environmental audit reports	
records of incidents	
job descriptions	
OPERATIONAL DETAILS	
Brief descriptions of site operations (for on site activities)	
Brief description of off-site activities	

annual purchasing of all raw materials and other goods	
AIR EMISSIONS	
Information on sources, control plant and monitoring	
Copy of authorization (if applicable)	
DISCHARGES TO CONTROLLED WATER/SEWER	
Information on effluents, stormwater drainage and foul drainage system	
Copy of consent(s) to discharge	
Monitoring results (internal, Water Company)	
WASTE MANAGEMENT	
Inventory of waste streams, quantities and routes of disposal	
Waste transfer notes (year to date)	
Special waste consignment notes (2 years to date)	
Waste minimisation programmes	
Waste recycling programmes	
HAZARDOUS MATERIALS	
Inventory of hazardous materials in storage (COSHH, List 1 and 2 substances)	
Details of underground storage tanks (size, construction, age, contents, integrity testing)	
NOISE	
Environmental noise survey reports	
Records of complaints and responses	
ASBESTOS AND OTHER DELETERIOUS MATERIALS	
Asbestos survey reports	
PCB survey reports	
Deleterious materials reports	
Removal action plans/programmes	
ENERGY (Electricity, oil, gas)	
Energy survey reports	
Usage and costs - billing/metering information for last 12 months	
Electricity - monthly maximum demands, unit consumption, power factor, load profiles	
Energy conservation programmes and targets	
Electricity	
Gas	

Oil	
WATER SUPPLY	
Water Quality Reports	
Usage and Cost - billing/metering information	
Water conservation - programmes and targets	

ANNEX 2

SITE GEOLOGY, HYDROGEOLOGY AND HYDROLOGY

AND

SITE HISTORY

**Prepared by
Environmental Assessment Group Ltd
for NRA**

1.0 SITE DESCRIPTION

1.1 Site Setting

The site is located approximately 1km east of Leigh and 3km west south west of Tonbridge at National Grid reference TQ 562 463 (see Figure 1). The facility is located in a rural location, accessed by a minor road. The A21(T) dual carriage way is located close to the sites western boundary, aligned north north west to south south east. There is a railway line aligned east to west located 360m south of the site. The River Medway is aligned parallel to the northern side of the railway line. The River Medway is flowing to the east. Additionally, there is a small stream 300m to the south south east, which meets the River Medway to both the west (200m) and east (1.5km) of the site.

1.2 Geology, Hydrogeology and Hydrology

1.2.1 Introduction

Desk-based research of the local geology and hydrogeology was carried out by EAG in order to establish the potential for liabilities due to migration of contaminants onto the site, from adjacent contaminative uses, or away from the site onto third party land. In particular, an assessment of the surface and groundwater sensitivity of the area was carried out.

1.2.2 Geology

Information on the geological stratigraphy underlying the site was obtained from a number of sources, namely:

- examination of geological and hydrogeological maps published by British Geological Survey (BGS);
- examination of borehole records in the vicinity of the site, provided by BGS headquarters, Keyworth, Nottingham; and
- review of the Policy and Practice for the Protection of Groundwater, Southern Regional Appendix, published by the National Rivers Authority (NRA).

According to BGS Sheet 287 (Sevenoaks), 1:50,000 series, the site is underlain by the Grinstead Clay beneath the northern part of the site and the Ardingly Sandstone beneath the southern part. Both the formations belong to the Tunbridge Wells Sand. This is underlain by the Wadhurst Clay, which can attain a thickness of up to 55m, which in turn is underlain by the Ashdown Beds. All these formations are divisions of the Hastings Beds series, Lower Cretaceous in age.

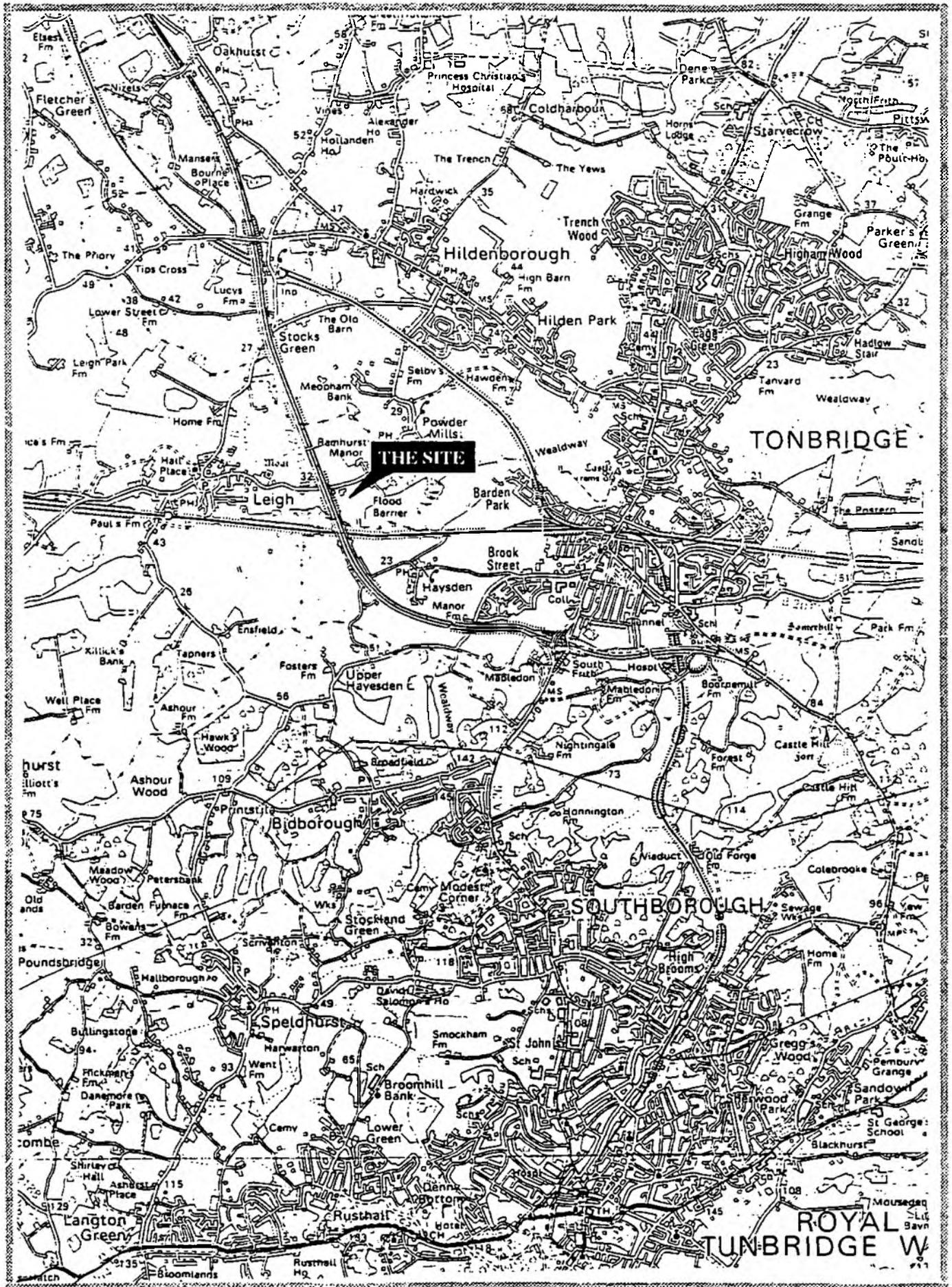
Figure 1.

SITE LOCATION

Date: March 1995

North

EAG



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The Grinstead Clay is a hard grey clay, 15m-25m thick deposit. The Ardingly Sandstone, which is essentially part of the Lower Tunbridge Wells Sand division, is massive sandstone, which can attain a thickness of 18m. The Wadhurst Clay comprises of shallow water rhythmic alternation of grey clays and shales with beds of siltstone and sandstone, the underlying Ashdown Beds comprise a soft buff coloured quartzose sandstone with subordinate silt and clay layers.

Structurally, these beds dip between 5°-10°, northwards. Within the vicinity of the site, these beds are quite heavily faulted by east-west trending faults and the whole series is broken up into isolated blocks by both strike and dip faults.

Details of the local geological stratigraphy more specific to the site area, was obtained from borehole records obtained from the BGS. Two borehole records are located within 200m of the site, the stratigraphy within these boreholes records are summarised below:

Borehole (TQ 5604 4646, 200m north west)

<u>Geological Classification</u>	<u>Strata</u>	<u>Thickness (m)</u>	<u>Depth (m bgl)</u>
Grinstead Clay	Grey/brown/blue, firm to stiff calcareous clay	3.58	3.58
Ardingly Sandstone	Grey/brown sandstone	3.74	7.32
Wadhurst Clay	Blue/grey, stiff/hard shaley clay	4.21+	11.53+

Borehole (TQ 5613 4621, 170m south west)

<u>Geological Classification</u>	<u>Strata</u>	<u>Thickness (m)</u>	<u>Depth (m bgl)</u>
Grinstead Clay	Grey/brown/blue, firm to stiff clay	1.83	1.83
Ardingly Sandstone	Grey/brown sandstone with occasional silt and clay bands	12.34	14.17
Lower Tunbridge Wells Sand	Grey, dense sand, with shaley clay and sandstone	4.42	16.15
Wadhurst Clay	Blue/grey, stiff/hard shaley clay	3.65+	19.80+

1.2.3 Hydrogeology

According to information obtained from the borehole records, groundwater strikes were encountered in the Ardingly Sandstone formation. The borehole to the north west encountered groundwater at a depth of 4.3m below ground level, the borehole to the south west, 8.3m below ground level. Given these relative depths to groundwater, the topographic fall of the area to the south, and the location of the River Medway to the south, the predicted groundwater flow direction would be towards the south.

The Tunbridge Wells Sand, of which both the Grinstead Clay and the Ardingly Sandstone are part of the formation, is according to the NRA, classified as a minor aquifer (a locally important aquifer). The groundwater quality is generally soft but may have high iron and manganese content and is also known to have free carbon dioxide. Generally, few groundwater abstraction sources are located in the formation due to the fine grained nature of the sands and the fragmented outcrops which produce variable and uncertain borehole yields.

Spring lines are common between the Tunbridge Wells Sand and the relatively impermeable Wadhurst Clay. The Wadhurst Clay, although classified as a non-aquifer by the NRA, is capable of providing small local supplies of groundwater for agricultural purposes from the more sandy and silty horizons. The main groundwater source is from the Ashdown Beds, which have been quite extensively developed and due to the fracture nature of the deposit can produce moderately high yields.

The nearest public water supply abstraction is located 1.4km to the south-south-west (Hayesden Pumping Station). The groundwater Source Protection Zone (SPZ) for this abstraction has not as yet been modelled. Additional information provided by the NRA (Groundwater Protection Department) indicates that the site area is not likely to fall in the SPZ for this public water supply. Additionally, according to information provided by the NRA Southern Region, the site is located on the boundary of the low to moderate groundwater vulnerability (as defined on the Southern Region Groundwater vulnerability map for Kent).

Groundwater Abstractions

From consultation with the NRA (Southern Region), the following licensed groundwater abstractions are within a 2km radius of the site. These abstractions and their groundwater uses are listed below and their locations shown in Figure 2.

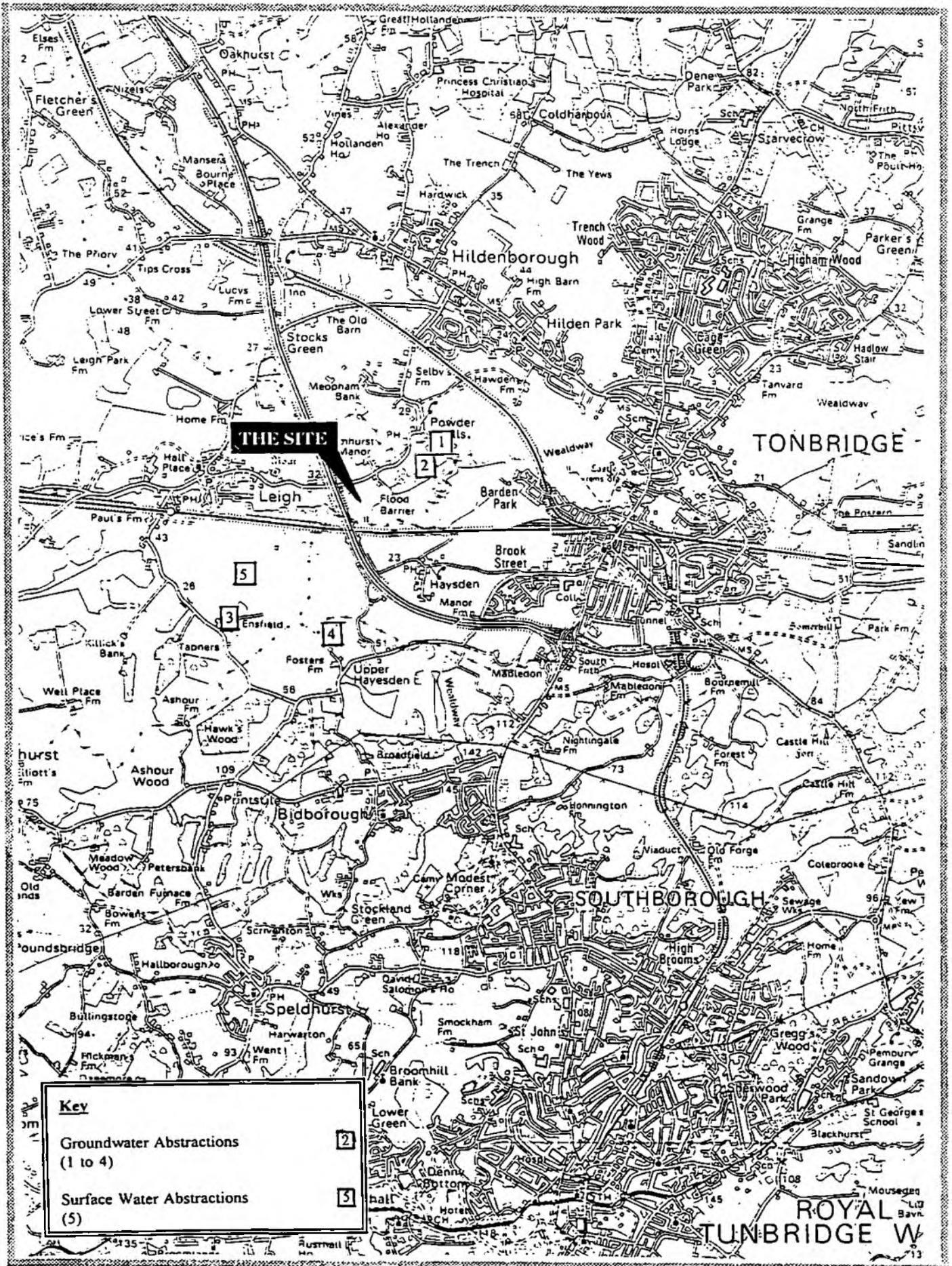
Figure 2.

LOCATION OF SURFACE AND GROUNDWATER ABSTRACTIONS

Date: March 1995

North

EAC



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No	Grid Reference	Distance & Direction	Licence Holder	Use	Source/Aquifer
1	TQ 570 468	0.95km NE	Smithkline Beecham Plc	Industrial cooling	Wadhurst Clay
2	TQ 569 466	0.75km NE	Smithkline Beecham Plc	Industrial	Wadhurst Clay & Tunbridge Wells Sand
3	TQ 551 451	1.7km SW	Viscount De L'Isle, Ensfield Farm	Agricultural	Ashdown Beds
4	TQ 561 449	1.55km SSW	West Kent Water Plc	Public Water Supply	Ashdown Beds

The abstraction locations are shown on Figure 2

Groundwater abstractions for private supply which, on the basis of volume, are exempt from licensing control of the NRA, require registration with the Environmental Health Department (EHD). The site is located close within the boundary of Sevenoaks District Council (SDC) and close to the boundary with Tonbridge and Malling Borough Council (TMBC). The environmental health departments of each of these councils were contacted. Both the SDC and TMBC informed EAG that according to their knowledge, there are no groundwater abstractions with the vicinity of the site for which they are responsible for monitoring.

1.2.4 Hydrology

The site is located in an area which topographically falls to the south. The site is located at approximately 35m above Ordnance Datum (AOD), the River Medway, is located at an elevation of approximately 25m (AOD), located 250m to the south of the site. Additionally, there are surface drainage channels in the vicinity of the site, the closest is 150m to the south south east, which drains south west towards the River Medway.

Surface waters in England and Wales are classified by the NRA. This classification scheme was changed in 1994 from the National Water Council (NWC) classification scheme to General Quality Assessments (GQA) classification scheme. The GQA classification is available from map data published by the NRA, and the nearest stretch of the River Medway is classified as Class D (fair quality). However, the Southern Region of the NRA are presently converting their river quality data to this GQA scheme, and water sample data (obtained by periodic monitoring) is still classified according the NWC scheme. The nearest sampling point located upstream of the site is Ensfield Bridge, Leigh (west of the site). The water quality objective at this point is Class 2, ie "waters suitable

for potable supply after advance treatment; supporting reasonably good coarse fisheries", however, the achieved quality was 1B ie "water suitable for potable supply abstractions; game or other high class fisheries". The nearest sampling location downstream of the site is Cannon Bridge, Tonbridge (east of the site). The water quality objective at the point was 1B, which was achieved.

There is only one water abstraction from the River Medway (located 1.3km south west of the site), which is listed below.

No	Grid Reference	Distance & Direction	Licence Holder	Use	Source
5	TQ 552 457	1.35km SW	R Bastable	Spray Irrigation	River Medway
The abstraction location is shown on Figure 2					

1.2.5 Significance of Geology, Hydrogeology and Hydrology

The site is considered to be located in a moderately low sensitive location with respect to the underlying aquifer type, the location of groundwater abstractions (distance and direction) and their respective use.

The nearest groundwater abstractions are located up-gradient with respect to the predicted groundwater flow direction. The groundwater abstractions which are down-gradient, ie to the south, include a public water supply (Hayesden), which although is considered a sensitive receptor it is located on the southern side of the River Medway and therefore shallow groundwater which is predicted to be moving southwards from the site area, is likely to be intercepted by the River Medway, and unlikely to impact the abstractions located further to the south.

It is expected that shallow groundwater beneath the site is likely to be in hydraulic continuity with the river and therefore, it is considered that the mobile contaminants arising from the site area, and present in the groundwater would present a risk to the quality of the water in the nearby River Medway.

1.3 Site History

1.3.1 Introduction

The site history has been researched by reference to Ordnance Survey and County Series maps, by referring to the site's planning history and other archive material.

1.3.2 Historical Development

The historical maps revealed that the site remained in greenfield use up until the construction of the NRA offices and depot in the early 1980s. The 1871 map shows the site and surrounds to be greenfield at that time, with the surrounding area in agricultural use.

An old gravel pit (occupied by a plantation) was located approximately 30m east of the site and further former gravel pits and two quarries were located 50m west, 400m south-east and 260m south-west of the site, respectively. Ramburst Farm and orchard was present 300m north and the River Medway flowing to the east, (160m to the south¹) with associated Long Reach. In the wider area, the South Eastern Railway (embanked), aligned east/west was present 360m south and the Tonbridge Powder mills and mill Dam were present approximately 700m north-east.

By 1897 a Gun Shed and a small excavation were located 160m to the south-east of the site. There were no changes to the surrounds, until 1937 with the construction of long staff farm 160m north. In addition, by this date an area of land located 300m east of the site appeared to have been excavated (possibly associated with the powder mill). This was later shown to have been landscaped and formed a plantation.

There was little change to the surrounds by 1968 except for the construction of Manor Farm forming the sites northern boundary and a small path 50m west of the site. An extensive drainage system associated with the River Medway was present 240m to the south-east and further industrial development had taken place to the north-east of the site comprising a chemical works (700m) and a plastics factory (900m).

The Tonbridge by-pass (embanked) was constructed 100m west of the site in 1973 and by 1982 the site was occupied by a depot comprising five buildings. The road/path bounded to the north of the site had been extended southwards, beyond the River Medway. According to Sevenoaks District Council Planning Department this was constructed as part of the River Medway Flood Relief Scheme. A gravel pit was present 1km to the south-east of the site which later formed Barden lake in 1993.

In addition, Sevenoaks District Council Planning Department revealed that the site forms part of the Manor Farm land to the immediate north of the site. Planning records indicate that 60 tonnes of LPG gas (in containers) is stored on the Manor Farm site.

¹ River Medway location 1871

1.3.3 Information from Kent County Council

The Waste Regulation Department of Kent County Council was contacted regarding the location of landfill sites in the area. According to the Council's records there are no operational landfill sites within 500 metres of the site and the site is consequently not considered to be sensitive to on-site migration of landfill gases or leachates.

1.3.4 Significance of Site History

The historical research has revealed that the site was in greenfield use up until the construction of the office and depot buildings in the early 1980s. As a result there is the potential for contamination as a result of the possible storage of fuel or oil at the depot, although the age of the site would provide some comfort.

The surrounding land uses have comprised former gravel pits which may have been infilled. If these have been backfilled with putrescible or industrial material this could provide a source for contamination of soil and groundwater. Further industrial activities were present to the north-east of the site, plastics factory, powder mill and chemical works which could potentially cause contamination via migration onto the site. However, their distance from the site reduces the overall risk.

ANNEX 3

REVIEW OF LEIGH SITE'S ENVIRONMENTAL SYSTEMS

AGAINST

BEST MANAGEMENT PRACTICES

1.0 BEST ENVIRONMENTAL MANAGEMENT PRACTICE

1.1 Introduction

Our approach was to review each stage of the management process in relation to:

- best management practice based on BS 7750: 1994 (shown in italics); and
- recommended future tasks that should be considered to effectively manage and monitor the sites environmental effects and performance.

2.0 ENVIRONMENTAL POLICY

2.1 Best Management Practice

To establish, define and document a site environmental policy strategy. The policy/strategy should be "initiated" and "actively supported" by senior site management and must be consistent with and adopted within the broader context of the NRA's Internal Environmental Policy Statement.

2.2 Recommendations

- the development of a comprehensive site environmental policy strategy statement which:
 - endorses the adoption of the NRA Internal Environmental Policy Statement at the highest site management level;
 - adopts the broader corporate philosophy of the NRA's Internal Environmental Policy Statement;
 - addresses and places into context the relevant environmental issues related to the nature of the sites activities and significant environmental effects;
 - states the relevant environmental targets and allocates responsibilities for their achievement;
 - states the sites actions and priorities with respect to the environment and details management responsibilities for each action; and

- establishes procedures for internal and external communication of the sites environmental strategy and to ensure that the strategy is regularly reviewed and updated in the light of audit results and changes to site and business activities.

3.0 ENVIRONMENTAL ORGANISATION

3.1 Best Management Practice

To establish and implement an appropriate environmental organisation structure which optimises existing skills and resources and is integrated into the overall framework of existing business and quality management site systems.

3.2 Recommendations

- the establishment and implementation of a site environmental management organisation. Figure 1 outlines a possible site environmental organisation to illustrate how environmental responsibilities could be assigned to the different parts of the site's organisation through the departmental managers. The benefits of such a structure would include:
 - spread ownership and accountability for performances to as many levels as possible;
 - matches responsibility to authority and the ability to manage and control resources;
 - actively encourage line management ownership of the issues;
 - the allocation of a senior manager with overall responsibility for site environmental performance and environmental management systems, who has the authority to make financial, personnel and technological decisions in connection with the environmental programme; strong relationship and business credibility with the other site line managers who can have a significant effect on the environment; appropriate seniority to demonstrate the correct level of management commitment to the environment; and the knowledge and experience of industrial activities at the site in order to make effective decisions;
 - the establishment of a cross-functional site Environmental Team to: advise the Area Manager on-site priorities and programmes; facilitate changes required to achieve improvements; monitor performance of improvement programmes review results of

audit compliance activities; maximise use of in-house skills and resources; and minimise central staff resource requirements;

- incorporation of environmental responsibilities and performance measurements within existing personnel system documentation e.g. job description; and
- the development of management procedures and communication programmes to make all site staff aware of the environmental effects of their work activities, the importance of compliance with NRA Policy, the site's environmental organisation and the roles and responsibilities allocated.

4.0 ENVIRONMENTAL TRAINING

4.1 Best Management Practices

The provision of appropriate environmental training for: senior site management personnel to ensure they understand the NRA's Internal Policy Statement, objectives and targets and have the necessary knowledge to play their part in it and understand the performance criteria by which the sites effectiveness will be measured and reported to executive management; other personnel, to ensure that they can make an appropriate contribution to the sites environmental performance and develop the necessary skills to manage and understand those environmental effects which result specifically from their area of work activity; and environmental awareness training for new recruits and staff assigned to new tasks.

4.2 Recommendations

- incorporation into the appraisal process of a review of employee environmental training and education needs;
- a site management review to establish the types of training required, eg:
 - good environmental management practices;
 - environmental protection legislation, in particular duty of care;
 - waste management systems;
 - monitoring and record keeping;
 - contractor awareness training; and
 - training for staff with specific environmental responsibilities.

5.0 ENVIRONMENTAL OBJECTIVES AND TARGETS

5.1 Best Management Practice

The establishment and maintenance of procedures to establish site specific environmental objectives and targets based on NRA policy and the evaluation of the sites significant environmental effects. The objectives and targets must ensure that all relevant legislative and regulatory requirements are complied with.

The sites objectives and targets must be consistent with the NRA's Internal Environmental Policy and should also actively pursue the NRA's environmental performance targets. The targets derived from each objectives should be demanding, quantitative and achievable.

5.2 Recommendations

- the development of detailed site objectives and measurements in terms of the levels of environmental performance set by the Authority and the site priorities.
- the establishment of management procedures to manage and meet the sites objective/targets within a time-scale agreed by site management; the procedures should include: designation of responsibility for each objective at each appropriate management level and function of the site; and
- the tasks and resources for achieving the objectives and targets.

6.0 ENVIRONMENTAL MANAGEMENT PROGRAMME

6.1 Best Management Practice

The establishment of an environmental management programme for achieving the intended objectives and targets. The environmental programme should address those specific activities carried out or necessary to meet the site's objectives for environmental improvements within the time-scales agreed by site management.

6.2 Recommendations

- The development, implementation and maintenance of environmental management programmes

to address those site activities identified as significant environmental impact operations and an issue for site managements attention.

Key management programmes include:

- compliance with the NRA Pollution Prevention Checklist;
- waste management and minimisation;
- energy consumption and conservation;
- on-site and off-site contractor performance (control of contractor chemicals, contract terms and conditions etc);
- site emergency planning and incident reporting and prevention;
- site chemical management;
- supplier performance;
- capital project management procedures.

7.0 ENVIRONMENTAL DOCUMENT CONTROL

7.1 Best Management Practice

To establish and maintain an Environmental Manual or Site Log (either in paper or electronic form) to bring together all the documentation and systems developed from previous actions.

The manual should address normal and abnormal operating conditions of the site's operations and accidents and potential emergency situations. Quality management procedures must also be established and maintained to ensure that all documentation can be identified with the appropriate site owner; are regularly reviewed and are available at all site locations where operations essential to the effective functioning of the environmental management system are undertaken.

7.2 Recommendations

- the development of a site Environmental Manual/Site Log.

The Leigh site does not handle complex or major polluting activities and the extent and level of documentation should, therefore, be developed accordingly. The documentation should wherever possible be integrated with existing site management systems and procedures and other forms of auditing documentation used by the site. Documentation should be kept as simple as possible.

ANNEX 4

EXTRACT FROM FLOOD DEFENCE

MAINTENANCE CONTRACT

8.9 Programme and Sequence of Work

The Contractor shall endeavour to programme the works so as to:

- a) Complete all aquatic weedcutting, reedpulling and grass cutting of banks during the period 1 July - 31 October each year.
- b) Complete all desilting works during the period 1 November - 28 February the following year.

8.11 Working Hours

The Contractor will be permitted to work between 7.00am and 6.00pm on weekdays (Monday to Friday) only. If the Contractor wishes to work outside these hours, he shall obtain permission from the Engineer at least 72 hours in advance of commencement of the work. such permission will not vexatiously be withheld.

8.12 Operational Constraints

The Contractor's attention is drawn to the constraints due to tidal conditions, excessively high water levels during heavy rainfall conditions and land owners not permitting access to watercourses due to potential crop damage by the contractor. This is often a severe constraint during the weedcutting season.

8.14 Depots and Compounds

The Contractor shall describe the location of the depots used for the Works with Tender Submission.

8.15 Specialist Plant

The use of specialist plant by the Contractor shall be at the prior approval of the Engineer.

8.16 Grasscutting Frequency

- (i) All lengths of Sea Defence grasscutting within the Contract shall be cut three times within the period stated in clause 8.9.
- (ii) Flood embankment downstream faces at Hall Place and Lamorbey Park shall be cut three times within the period stated in clause 8.9.
- (iii) At the confluence of the rivers Wyncham and Shuttle downstream on the Shuttle both banks shall be cut three times within the period stated in clause 8.9.
- (iv) The Chipstead Relief Channel shall receive three cuts to both banks and bed during the period stated in clause 8.9.

b) Refuelling of Plant and Machinery

All deliveries of oils and refuelling of machinery must be supervised by a responsible person, and records kept.

The refuelling of machines shall be strictly controlled and will be confined to designated locations remote from any watercourse or drain.

The carrying of extra supplies of fuel on or in plant not designated to do so will not be permitted.

Maintenance or repair work which could result in loss of lubricant or fuel must not take place in, or directly adjacent to a watercourse.

Mobile fuel and servicing units should be fitted with appropriate quality delivery hoses to BS 3395. Trigger type delivery nozzles should be fitted.

Mobile fuel and servicing units must not be left unattended on site. They must be removed from site or locked in a secure compound when not in use.

c) Storage of Fuel Oils and Lubricants

All oils, lubricants, chemicals and fuels where the quantity exceeds 45 gallons (200 litres) must be stored in a secure bunded area. The bund must be of sufficient capacity to retain 110% of the full contents of the store.

The location of such a store will be by prior agreement with the Engineer and will be as far as is reasonably possible from any watercourse, gully or drain.

Delivery points and vent pipes must be within the confines of the bunded area.

Bunds must not be fitted with an outlet for the removal of contaminated surface water. Disposal of the bund contents to take place only after authorisation by the Engineer.

Outlet valves of storage tanks must be locked when not in use. The keys to be held by a responsible person.

Tank inlet design must be such that a syphon effect cannot be created.

Fuel and lubricants held in quantities of 45 gallons (200 litres) or less must be stored within a bunded pallet.

Fuels and lubricants must not be left unattended on site. If this is not reasonably practical they should be sufficiently secured to ensure they are not discharged by third party intervention.

d) Containment of Spillages

The contractor must notify the engineer **immediately** of any spillage on site.

Any spillage shall be contained and mopped up **immediately**.

An adequate supply of oil absorbent materials will be held on site at all times.

Contaminated materials will be disposed of in a responsible manner to a licensed waste disposal site. Contaminated soil will be replaced with fresh topsoil.

e) Works within watercourses

Any plant entering a watercourse must be free from oil, hydraulic fluid and fuel leaks.

Crossing within the watercourse must be kept to a minimum, and only after prior consultation with the Engineer.

f) Cementitious materials

Prior approval by the Engineer will be required prior to undertaking any works involving cementitious materials.

g) Timber treatment

All treatment of timber should be undertaken away from any watercourse, preferably within a controlled environment off site. Treatment adjacent to the watercourse may only be undertaken after prior approval from the Engineer.

3.14 Noise and Vibrations

The Contractor shall employ the "best practicable means" as defined in the Environmental Protection Act 1990 to minimise noise and vibration resulting from his operations and shall have regard to the British Standards BS 5229: 1974 (Code of Practice for noise control on construction and demolition sites), and in particular:

- i) The Contractor shall ensure that all vehicles, plant and machinery used during the operations are fitted with effective exhaust silencers and that all parts of such vehicles, plant or machinery are maintained in good repair and in accordance with the manufacturers instructions, and are operated so as to minimise noise emissions.

- ii) Only 'sound reduced' compressors or other alternatives approved by the local authority are to be used, and any equipment or panel fitted by the manufacturer for the purpose of reduction of noise shall be maintained and operated so as to minimise noise. Any pneumatically operated percussive tools shall be fitted with approved mufflers or silencers which shall be kept in good repair.
- iii) Any machinery which is in intermittent use shall be shut down in intervening periods of non-use or where this is impractical, shall be throttled back to a minimum.
- iv) Items of plant shall be in good working condition so that extraneous noise from mechanical vibration, creaking and squeaking, shall be reduced to a minimum.

If nuisance is to be caused by any operation, the Contractor shall notify the Environmental Health Department of the Local Authority of the equipment to be employed, the duration and extent of this part of the works and any steps to be taken to minimise noise or vibration.

3.15 Water Awareness Course

It will be expected of the Contractor that all his plant operatives, all supervisory staff and other selected members of his workforce should attend training sessions at the Employers office before commencing work on site. Sessions will be provided at the commencement of the contract, and within 4 weeks of a request, during the contact. The course will cover aspects highlighting issues relating to conservation, pollution and safety, for those working in the water environment. The course will be approximately half a day's duration. At all places of work, at least one member of the Contractor's personnel (directly employed or sub-contractor) must have attended a course. The contractor should allow for this in the General Items section of the Bill of Quantities, only one course per individual per annum is required.

3.16 Conservation of the Environment

- a) The Contractor shall take all reasonable precautions to ensure that the work in any watercourse or waterbody is done in an environmentally sensitive manner such that it will not cause unnecessary damage to fauna and flora and their habitats.
- b) The Contractor shall work between trees, over hedges and around shrubs so as to minimise the amount of disturbance where possible. Other non-woody species of high conservation value may also be identified to be avoided in a similar way.
- c) No trees, shrubs or hedges are to be removed unless specified or prior approved by the Engineer.

- d) Where sites of particular conservation interest are identified by the Engineer, then it is the Contractor's responsibility to locate and determine the physical boundaries on site.
- e) Care must be taken in the choice of machinery used and time of entry, such that potential for damage should be no more significant than normal practices present. Generally rutting and/or compaction damage should be avoided.
- f) Machinery used must be appropriate to the size of the watercourse, to safeguard the conservation interests by reducing the risk of overdig and damage to banksides, vegetation and trees.
- g) Heavy loads should not be positioned around trees or over tree roots. Generally, materials should not be stored over tree roots and no heavy plant should pass under tree canopies without prior approval.
- h) Where heavy plant routes adjacent to trees are unavoidable, obtrusive branches should be tied back prior to work commencing. If absolutely necessary, branches should be cut back in accordance with the section on Tree Surgery in the Standard Specification. Branches are not to be broken off or snapped. Work relating to the protection of trees should conform to BS 5837 : 1991 - Trees in relation to construction.
- i) Where plant is to move in close proximity to trees, chestnut pale fencing or similar protection is to be provided to the tree trunk to avoid scraping and scarring the tree.
- j) Peat imported to site or peat-based materials shall not be used.
- k) Any hard woods used must be from a sustainable source. Certification must be provided.

3.17 Exposed Flood Defences

Works on flood defences should be completed in sections to avoid large areas of defences being exposed at any one time to adverse conditions and/or high water levels.

3.18 Working Direction

Unless otherwise stated works are to be carried out starting at the furthest downstream point.

c) **Inspection and measurement**

The Contractor will be delegated powers under Section 170(1) of the Water Resources Act 1991 to enter onto land and premises for the purposes of carrying out visual surveys, inspections and measurements.

3.22 Maintenance of Flood Defences and River Flows

The Contractor's operations shall not reduce the effectiveness of existing flood defences. Before any flood defences are altered, the Contractor shall obtain the Engineer's written approval.

The Contractor shall ensure that the channel is kept clear of debris and river deposits arising from any work he undertakes throughout the period of the Contract. He must further ensure that no debris is permitted to be washed downstream beyond the works which may cause obstruction to the flow at any place below the Site.

Particular consideration of the method of work will be required when undertaking works upon flood defences situated in tidal or coastal locations.

3.23 Disposal of Materials off Site

Material to be removed from site shall be removed and disposed of in accordance with the Environmental Protection Act 1990. Such material may only accumulate on site for the purposes of collection and drying and must be removed from site as soon as practicable.

Material may only be transported by a registered carrier.

Full documental evidence of the collection, transfer and disposal of waste, in accordance with a "Duty of Care: Controlled Waste Transfer Note" (Annexe C Environmental Protection Act 1990, Waste Management, The Duty of Care A Code of Practice) and "Duty of Care - Controlled Waste Transfer Regulations" made under the Control of Pollution (Amendment) Act 1989 must be copied to the Engineer.

Copies of all weigh/tip tickets must be forwarded to the Engineer as soon as practicable.

The Contractor shall ensure that he is registered under the Control of Pollution Act (Amendment) 1989 or any statutory modification or re-enactment thereof, for the purpose of transporting and disposing of such waste as it may be necessary to remove during the execution of the Contract. Evidence must be displayed to the Employer. The Contractor should note that cut vegetation, dredged spoil and other similar arising from works are considered as waste when taken off site, and should therefore be disposed of as above.

30 USE OF HERBICIDES

General

1. The Contractor must comply with:
 - (a) Part III of the Food and Environmental Protection Act 1985 and Control of Pesticide Regulations 1986
 - (b) National Rivers Authority: "Use of Herbicides in or near water".
 - (c) "Guidance for Control of Weeds on Non-Agricultural Land" published by Department of Environment.

Selection

2. The appropriate chemical will be specified by the NRA. The Contractor may choose the appropriate proprietary product from the approved NRA list.

On Site Storage

3. For the purposes of maintenance work only sufficient quantities of herbicide required to complete the job should be kept on site.
4. Local storage conditions must be secure and not pose any threat of contamination of surface or ground waters.

Application by Competent Person

5. Operative involved in the application of herbicides must be in possession of a current Certificate of Competence issued by the National Proficiency Test Council relating to the application method to be used (proof will be required).

Supply of Water

6. Clean water from an approved source must be used. Unless otherwise agreed, water from the watercourse may not be used.

26. The germination and purity of grass seed mixtures shall be BS4428. Certificates of Germination and Purity will be required from the seed supplier, together with a copy of the blend sheets, relating to each mixture. The Contractor will be required to retain all bag labels for inspection and samples of seed may also be requested for analysis.
27. The Contractor shall take proper care to ensure that seeding operations are carried out whilst soil temperatures are conducive to germination. Seeding operations will be carried out in the period 15 March to 30 September.
28. Seed shall be mixed to ensure an even distribution of seed species, then halved and spread in two directions at right angles. The seeded area shall be immediately lightly raked by the use of a chain harrow, or other plant approved by the Engineer, in order that the surface of the topsoil covers the seeds.

Reinstating Vegetation from Stripped Material

29. Vegetation, roots and seeds from the original topsoil strip shall be reused to re-establish the original flora/fauna on the defence. The stockpiled stripped vegetation will be spread on the new topsoil and thoroughly rotovated into the soil and left to germinate. The timing of this operation must be agreed with the Engineer.

Turfing

30. Turfs shall consist of either meadow turf or seawashed turf dependent on their positioning in the Permanent Works and shall be 300mm wide and of maximum length 1 metre. Turfs shall not be lifted or laid in frosty weather or during periods of drought.
31. Turf shall be a minimum thickness of 40mm. for application on coastal/tidal embankments and 25mm. for application on fluvial embankments and shall be used within one week of cutting. Any turfs not used within this period shall be discarded and in the case of such rejected material, no payment will be made for cutting, handling or supply.
32. Surfaces to receive turf shall be comprehensively raked and screeded to remove all irregularities.
33. Turfing shall be undertaken in such a manner as to ensure that all turfs are well bonded; they shall be lightly beaten and shall be laid diagonally across embankment slopes commencing at the toe of the embankment and progressing without a break to the crest.
34. Where specified wooden pegs 200mm in length should be used to hold down the turf. Turf shall be pegged in all four corners.

200 SAND BAGS

1. The foundation for the sand bags is to be free from deleterious and loose material to form a firm footing.
2. Sand bags are to be laid in conventional stretcher bond, with the surplus bag material neck tucked beneath the material.
3. Sand bag walls greater than three courses high are to be formed of alternate header and stretcher bonds.
4. Sand bags to be 360 x 840mm Hessian sand bags complete with the strings, to BS 1214. The Hessian shall be type C fabric and rot proofed to BS 2087.
5. Where bags are to be filled with sand it shall be soft sand.
6. Where bags are to be filled with concrete, it shall be at the rate of 40 bags per tonne of semi-dry concrete (cement/aggregate ratio 1/6).
7. Sandbags should not be overfilled, such that they are incapable of being stacked on top of each other. Normally 75% of capacity should be adequate.

210 FENCING

1. All fencing shall be in accordance with BS1722 (Parts 1-13).
2. Fence posts are not be concreted into the ground unless otherwise stated.
3. All fences shall be erected to present a flowing alignment both in plan and elevation, following approximately the line of the ground and the Contractor shall trim the ground along the line of the fence, if required by the Engineer.
4. The fencing shall be neatly and efficiently joined to existing hedges, fences and to other structures and parapets.
5. All timber fencing material shall be from sustainable sources in accordance with Authority conservation policy.